

THE
BRITISH RAILWAY
POSITION

"The Statist," LONDON

10/- net

LIBRARY
OF THE
UNIVERSITY OF CALIFORNIA.

Class

Digitized for Microsoft Corporation
by the Internet Archive in 2007.

From University of California Libraries.

May be used for non-commercial, personal, research,
or educational purposes, or any fair use.

May not be indexed in a commercial service.

THE
BRITISH RAILWAY POSITION

PRINTED BY
SPOTTISWOODE AND CO. LTD., NEW-STREET SQUARE
LONDON

THE
BRITISH RAILWAY POSITION

BY
GEORGE PAISH

Reprinted from **The Statist**

WITH AN INTRODUCTION
BY
MR. GEORGE S. GIBB
GENERAL MANAGER OF THE NORTH-EASTERN RAILWAY



LONDON
The Statist
1902

HE3016
.P2

GENERAL

INTRODUCTION

BY MR. GEORGE S. GIBB.

AN INTRODUCTION by a railway manager to a book containing severe criticisms of railway management may perhaps be a novelty. But when Mr. Paish asked me to write an Introduction to his book I felt that the situation had its advantages from my point of view, and that the opportunity was not one to be lightly thrown aside. Not that I mean to use it, in any undue measure, to criticise our critic. To do so would be both unfair and inopportune. But a certain liberty of dissent may perhaps be permitted in the Introduction, especially if any fresh light can be thrown upon the subjects dealt with in the book.

The valuable articles in *The Statist*, now republished, urge upon English managers, firstly, that more information than they possess is needed as to several particulars of railway working; and, secondly, that more ought to be done, and can be done, in the direction of increasing train loads and waggon loads and decreasing train mileage.

As regards the lack of necessary information

it is said (p. 16) that 'English published reports contain no information whatever as to the average receipts per passenger per mile and per ton of freight per mile ; no particulars as to the ton or passenger mileage, the train load, the car load, or the length of haul—all of which are essential to the administration of a railway on modern scientific principles.'

Not only is the information absent from the published reports, but it is known not to exist. It has not been the practice in England to compile such information, and it is argued by Mr. Paish (p. 107) that 'only when railway managers possess detailed information as to the amount, nature, and profitability of every class of traffic arising on every portion of their systems can they devise plans for handling it in transit, at the terminals, and at transshipment centres, with the least waste of car and engine mileage, of machinery power, of labour, and of time.' The question raised is whether it would be useful, for practical purposes, to have particulars as to passenger mileage and ton mileage, and as to waggon miles, train loads, waggon loads, and length of haul. In my judgment it would. I am willing to agree with Mr. Paish that railway managers have been severely handicapped by the want of these statistics, a want borne so long, on account, probably, of the heavy weight of custom in England.

It is unnecessary to show by any elaborate argu-

ment that detailed information as to receipts and costs in any business are essential to good management. No sensible man will doubt this, and to no business is it more applicable than to the vast and highly complicated business or group of businesses embraced in a large railway undertaking.

It ought also to be unnecessary to show that average figures are useful. They are the only figures available for dealing with certain important items in any business.

No doubt averages must be carefully used. They are pitfalls for the ignorant and unwary, and dangerous weapons of offence for the sinister and cunning. But, with all their dangers and defects, we cannot do without them. If a business man were heard to say that he did not use any average figures in his business, that remark would probably be taken to indicate a low average of intelligence.

But after all the question now under discussion does not turn on whether or not average figures are to be used. Those who decry the ton-mile unit do not propose to discard the train-mile unit on the ground that train-mile figures are only averages. The whole controversy refers only to the selection of the best statistical unit for railway accounts.

Moreover, the minuteness of detail into which average figures are pursued is a matter of individual choice, and depends on the practical necessities of

each case. Averages can be analysed just as far as necessity requires and the cost of analysis will permit. In this respect there is no difference between ton-miles and train-miles.

The inherent vice of the train-mile unit is its uncertainty. As a standard of measurement a train is little better than the historical lump of chalk. One train may carry 600 tons, or, in America, perhaps 3,000 tons of paying freight, whilst another train may consist of two small waggons, with two tons in each waggon, run at a loss under the incentive of keen competition. In train-mile statements each of these trains are treated as if they were identical. Hence, whilst train-mile figures are most useful—essential, indeed, for some purposes—they are, for other purposes, utterly unsound and worthless. Why should not both ton-miles and train-miles be used according to their respective values for the purpose in view at the moment? Surely in selecting a statistical unit for any statement it is invariably right to choose the best that is available.

The mile, as a unit, is common both to train-miles and ton-miles, and no unit of distance can be better. But the train varies so widely in its composition that it is wholly unsuitable for the purposes of exact measurement of work done. The ton, on the other hand, is a unit of weight as constant and uniform as the mile. It is, moreover, the unit

habitually used for charging purposes. Almost all railway rates for freight traffic are charged per ton-mile. What reasonable objection can therefore exist to the use of the ton for statistical purposes in combination with the mile?

It may be said that the cost of running a train does not vary in the same ratio as the weight of the train, and that train-mile cost is, with all its defects, a more reliable figure than ton-mile cost. There is much truth in this; but it seems to me to point, not to an entire refusal to use the ton-mile unit, but to a constant necessity for care in its use. I fully admit that any figure of ton-mile cost will mislead quite as much as, though probably no more than train-mile cost, unless it is carefully and candidly dealt with. But may we not rely upon the existence of the virtues of care and candour amongst railway experts?

The value of ton-mileage is that it gives a knowledge not otherwise obtainable of the most vital elements in the cost of working freight traffic—namely, the train load and the length of haul. The train-mile unit conceals, the ton-mile unit reveals those all-important facts. The revelation is worth paying for.

How much the payment need amount to cannot be accurately stated without more experience than we have had in England of compiling ton-mile and passenger-mile statistics. Loose estimates have been

put forward by opponents of ton-mile statistics giving the cost for a large system at 20,000*l.* per annum. This estimate is very wide of the mark. With proper organisation the cost should not be great. It certainly will not exceed an annual sum quite small in relation to the benefit to be derived from the possession of the statistics.

Although I advocate the regular compilation of passenger-mile and ton-mile statistics, so that the management of a railway may have the figures available for practical use—monthly at least, if not at shorter periods—I would at the same time urge great caution in the use of any cost figures derived either from train-miles or from ton-miles, except for carefully limited purposes. It is easy to entertain exaggerated notions as to what can be done with ton-mile figures, although it may be natural that those who feel that they cannot get on without them should over-estimate what can be done with them. It is said by Mr. Paish (p. 223) that, by adopting statistical methods based on passenger-miles and ton-miles, ‘the general manager of a railway will possess accurate information of the cost of moving a ton and a passenger, and he will be able to justify to the Railway Commissioners or to the customers of the company any rate which may be made after the cost of carrying the individual article has been considered.’ A most soothing and attractive prospect

for a general manager ! I will promise, in view of the allurements of this prophecy, to keep an open mind on the subject. But is not the statement that the cost of moving a passenger and a ton can be obtained from a knowledge of passenger mileage and ton mileage rather too unqualified ? I fully agree that the possession of ton-mile and passenger-mile statistics will permit a closer approximation to reality than can now be made in estimating cost in many matters of railway working. The ton-mile gets rid of one source of error inherent in the train-mile ; but it must not be forgotten that ton-mile cost is merely total cost divided by ton-miles, whilst train-mile cost is total cost divided by train-miles. The dividend in either case is the same—that is to say, the total cost—and a fallacy in the dividend is not cured by altering the divisor. The use of train-mile figures in a calculation which seeks to separate passenger cost from freight cost, no doubt piles fallacy upon fallacy. Consequently it will be an advantage to restrict the use of one of the unreliable factors—the train-mile—and to bring to its aid the more accurate ton-mile. But it is in the ascertainment of the total cost of the separate branches of railway service that the main difficulty lies. A railway is worked as a whole, and, although many items can be separated in the accounts and allocated to particular services, the residue, which no knowledge and no ingenuity can

allocate, is so large that the result must always be a very distant and doubtful approximation to actual fact. This is not surprising when it is considered that the fact itself is of the nature of a metaphysical abstraction. There is no such thing, in fact, as the cost of moving a passenger by himself or a ton by itself. It is impossible to ascertain the separate cost of working passenger, goods, and mineral traffic on a railway, because these kinds of traffic are not separately worked, except in regard to some items of the service, and although, according to our present methods, the absurdity is increased by dividing the total cost by train miles, the cost being guessed at by any process congenial to the mental peculiarities or adopted to fit in with the practical aims of the person who guesses, the initial absurdity cannot be got rid of by using ton-miles and passenger-miles as the divisor.

This, however, does not diminish the necessity for knowing ton-miles and passenger-miles. It merely limits the field for the employment of the figures. Their main use is practical, not theoretical. They do not enable persons bent on pursuing some unsound theory of railway rates to establish economic heresies. But they do enable a railway manager to test the work done in carrying passengers and merchandise on any part of the railway, to measure the work performed in relation to many important items of cost incurred in performing it, to compare period

with period and district with district, to supervise local staff with a full knowledge of results, to control train mileage, and to enforce economy in working. These are solid benefits.

As regards the second branch of the main argument in the book, I find myself, as in the case of the first branch, in substantial agreement with the writer. I have no doubt that more can be done than has been done in the direction of increasing train loads and waggon loads in England, and, further, that more will be done as soon as better statistical information is ready for practical use by the management. So much can be said even without reference to experience in other countries. The figures, when plainly set forth, will show to what lengths competition and other causes have induced railways to go in the direction of carrying light loads, and will constitute a wholesome check upon extravagance in train mileage for merely competitive or subordinate purposes.

But, although the inferences drawn from Indian, Canadian and American experience are, I think, largely warranted, I should be very cautious at present in attempting to define the extent to which waggon loads and train loads can be increased in England. The American figures are apt to mislead, unless they are most carefully studied. It is widely believed that all American rates are lower than English rates. I observe that reference is made by

Mr. Paish (p. 32) to the 'immense advantages derived by our American competitors in the manufacturing and marketing of their products and produce from the extremely low rates now charged by American lines.'

In statements about American and English rates sufficient care is not always taken to compare the gross rates paid by the English and American competitors, and to distinguish between rates for short distances—which form the bulk of English rates—and rates for long distances, which constitute the great majority of the low rates on American railways. The effect of the terminal on the mileage rate is apt to be overlooked. Take, for example, grain traffic. The terminal charges authorised for station accommodation and services for that traffic amount to 2s. 8d. per ton, and anyone having practical acquaintance with the heavy burden of terminal cost in dealing with goods traffic will be the least ready to doubt that the terminal charge, whether the work is done in America or in England, is necessary to cover the cost. Assume, then, that a consignment of grain is carried for a distance of twenty-two miles, this being the actual length of the average haul of all freight traffic upon the North-Eastern Railway. Assume also—this being, of course, a mere assumption for the sake of illustration—that the actual charge for conveyance is $\cdot 76d.$ per ton per mile. The English rate, excluding collection and

delivery (a service performed by the railway company in England and included in many of their rates, but not included in any American rates) would on the above-mentioned basis be 4s. 1*d.*, made up as follows :—

Terminal	.	.	.	.	.	.	.	<i>d.</i> 32
Conveyance (22 × .76)	.	.	.	.	.	.	.	17
								<hr/> 49

This rate is practically the same as would in fact be charged on the North-Eastern Railway for a consignment of 5 tons, and the illustration may therefore be taken as a practical one. The rate works out at 2·2*d.* per ton per mile.

Now assume a haul of 200 miles, and if the same mileage rate were charged for conveyance the rate would be

Terminal	.	.	.	.	.	.	.	<i>d.</i> 32
Conveyance (200 × .76)	.	.	.	.	.	.	.	152
								<hr/> 184

which works out at .9*d.* per ton per mile on the distance. The effect, therefore, of the greater proportion which the terminal charge bears to the mileage in a short-haul rate than in a long-haul rate would justify, on the figures used in the above illustration, an addition of 144 per cent. to the gross rate per mile in the case of the short haul. In other words, the real difference between English and

a

American rates is much less than appears to be the case from a casual comparison between average rates, without taking account of the average haul.

In dealing with average train loads, also, it is most unsafe, in comparing English and American loads, to deal with average figures without analysis, and without comparing commercial and physical conditions, such as gradients and bridge gauges. Mr. Paish is careful to show the facts in regard to the loads, and his readers must be careful not to draw unsound inferences from those facts. He sets out (page 37) a table contrasting the average train load of 484 tons of freight on the Pennsylvania Railroad with an estimated average train load of 68 tons on the London and North-Western Railway. The table, to which I have added the North-Eastern figures, shows the ton-miles and train-miles per mile of railway as follows :—

	Train miles per mile of railway	Tons of freight moved over each mile of railway
Pennsylvania	8,054 × 484	3,896,646
L. & N.-W. Railway . . .	11,707 × 68	802,774
North-Eastern Railway . .	10,041 × 67·7	692,000

It is apparent from these figures that the Pennsylvania has nearly five tons to carry over each mile of its railway for every one ton which the North-Western have to carry.

This aspect of the matter must not be lost sight

of. The conditions which enable large loads to be obtained are very obscure, and Mr. Paish is conferring a great benefit on railway people by initiating a detailed examination of the subject. In the United States there are wide differences between the average train loads on the different railways, as the following table, compiled from accounts for the year 1900-1, will show :—

Railway	Mileage	Train miles per mile	Average train load	Tons of freight moved over each mile of railway
New York Central .	2,828	5,727	Tons 367	2,134,000
Lake Shore . . .	1,411	5,644	454	2,567,000
Chesapeake and Ohio .	1,506	3,962	511	2,025,000
Northern Pacific . .	5,100	1,317	328	478,000
Great Northern (U.S.).	5,451	1,194	381	455,000

In the Western States of America, where the density of traffic is lighter, but competition is less tyrannous, large train loads are secured by holding traffic longer ; whilst in the Eastern States the greater keenness of competition is balanced by a greater density of traffic. In England we have a relatively low density of traffic, and the customs of trade have imposed on railways methods of conducting business which certainly do not conduce to heavy loading. Whether these customs are too inflexible for the efforts of railway managers to overcome, time alone will show.

I should like to say, in conclusion, that although I have acceded to Mr. Paish's request to write an Introduction to his book, I take no responsibility whatever for any of the facts or opinions stated or expressed in it. It will be evident from what I have written that, whilst welcoming the criticisms and heartily approving the direction in which Mr. Paish urges English railways to move, I share with the writer the conviction he seems to hold—that more information is needed before any safe conclusions can be drawn as to what it is possible for English railways to do in order to reach the highly desirable goal of increased train loads and decreased train mileage.

GEORGE S. GIBB.

YORK.



P R E F A C E

IN the early months of 1899 I visited the United States, with the object, among other things, of testing the claim made by certain American Railroad Companies, that the enormous growth in their profits had resulted chiefly from the adoption of the principle of loading trains up to the capacity of the most powerful locomotives their bridges and their roadway would bear. And I was convinced that the claim put forward was justified. Since 1899 the economy of working heavily loaded freight trains has become more and more apparent, and most of the railroads of the United States are now working with greater economy than a few years ago was considered to be practicable. With a large amount of traffic carried with great economy, the profits of American railroads have now attained to phenomenal figures.

During my visit to the States an able American

Railroad President, who had closely studied the practical working of British railways, severely criticised our methods of operation, and expressed his conviction that our railways could be worked with much greater economy and efficiency. My investigations, and I may say the investigations of others, have confirmed the criticisms of the American railroad expert, and have clearly shown that the adoption of the principles which have been so beneficial to the railways of the United States will be equally advantageous to our own railways. Mr. Gibb's recent action in reorganising the traffic department of the North-Eastern Railway, and in deciding to compile ton mileage, train load, car load, and other data essential to economical management, prove that the investigations of the chief official of one of our great companies have also convinced him of the advantage of the American as compared with the British method of working.

The economical working of our railways is of very great importance, for upon its solution in some measure depends the future prosperity of the country. No one whose business or duty it is to

watch the marvellous developments of industry in the United States, and to mark the progress of that country in the economical manufacture of iron and steel, of machinery of all kinds, including electrical plant, of locomotives, of railway carriages, of tools, of bridges, of cotton and woollen cloths, of boots and shoes, of alkali, and of other products, can deny that this country has ever been in greater danger of having to relinquish her premier position in the world's markets. And under such conditions it is imperative that no feelings of pride or prejudice shall stand in the way of our accepting principles the adoption of which will assist us to manufacture more economically.

GEORGE PAISH.

LONDON.

In publishing the following revised articles, which have appeared in *The Statist* during the past few months, the editors of that journal appeal to men of business to assist in introducing into this country more economical methods of railway working. Many of the railway companies now recognise the advantage of heavier train and car loads, and are

endeavouring to introduce the new methods. But the progress they will make will in some degree depend upon the action of dock boards, and upon owners of collieries, of iron mines and of industrial works, whose appliances require to be adapted to the use of larger waggons, and it is here that business men guided by principles of enlightened self-interest can greatly help the movement.

THE EDITORS OF *THE STATIST*.

LONDON.

CONTENTS

	PAGE
INTRODUCTION	I
PREFACE	5
CHAPTER	
I. GENERAL CONDITIONS OF WORKING	11
II. COST OF MOVING TRAFFIC IN ENGLAND AND AMERICA COMPARED	31
III. CONTRAST OF THE EARNINGS AND EXPENSES OF THE LONDON AND NORTH-WESTERN AND OF THE PENNSYLVANIA RAILWAYS	43
IV. THE ALLOCATION OF EXPENDITURE BETWEEN PAS- SENGER AND FREIGHT TRAFFIC	53
V. COMMENTS OF LORD STALBRIDGE, THE CHAIRMAN OF THE LONDON AND NORTH-WESTERN, ON THE FOREGOING COMPARISONS	57
VI. THE REPLY TO LORD STALBRIDGE	60
VII. MORE INFORMATION NEEDED	68
VIII. RAILWAY STOCKHOLDERS' ASSOCIATION SUGGESTED BY A SHAREHOLDER	80
IX. APPROVAL OF THE SUGGESTED RAILWAY SHARE- HOLDERS' ASSOCIATION	83
X. MR. TOUCH ON THE SUGGESTED RAILWAY SHARE- HOLDERS' ASSOCIATION	90
XI. GROWING TRAIN LOADS	97
XII. MR. GREEN ON THE RAILWAY POSITION	108

CHAPTER	PAGE
XIII. HOW TO OVERCOME THE DIFFICULTY IN INTRODUCING WAGGONS OF GREATER CAPACITY—THE ECONOMY OF LARGE WAGGONS	113
XIV. AN INDIAN RAILWAY EXPERT ON HEAVY TRAIN LOADS AND LARGER WAGGONS	124
XV. THE ESSENTIALS TO PROSPERITY	130
XVI. THE COMPETITION OF ELECTRIC TRACTION	138
XVII. THE LONDON AND NORTH-WESTERN—I.	142
XVIII. THE LONDON AND NORTH-WESTERN—II.	165
XIX. THE MIDLAND RAILWAY.	169
XX. THE GREAT WESTERN RAILWAY	190
XXI. THE NORTH-EASTERN RAILWAY—I.	214
XXII. THE NORTH-EASTERN RAILWAY—II.	235
XXIII. THE NORTH-EASTERN RAILWAY—III.	255
XXIV. THE MANAGER OF THE NORTH STAFFORDSHIRE RAILWAY ON THE VALUE OF TON MILEAGE STATISTICS	266
XXV. THE LANCASHIRE AND YORKSHIRE RAILWAY	270
XXVI. INDIAN RAILWAYS AND TRAIN LOADS—THEIR EXPERIENCE OF THE VALUE OF TON MILEAGE	297
XXVII. GROWTH IN THE LOADING OF FREIGHT TRAINS IN THE UNITED STATES, INDIA, AND ENGLAND COMPARED	307
INDEX	309

THE BRITISH RAILWAY POSITION

CHAPTER I

GENERAL CONDITIONS OF WORKING ¹

THAT the railways of this country have suffered severely from the high prices of fuel and material, and from the advance in wages, is admitted, and that they will appreciably benefit by the fall in prices now in progress is also beyond question; but the fact remains that, had our railways given greater attention to the loading of their trains and to the saving of train mileage, the decline in their dividends for the twelve months to June 30, 1901, would have been greatly minimised. Indeed, we may venture the opinion that had our railways followed the example of their American *confrères*, and loaded their trains more heavily instead of adding to train mileage as quickly as the traffic grew in the recent period of prosperity, the dividends for 1900, in spite of the high prices,

¹ This article appeared in *The Statist* of April 27, 1901.

would not only have shown no shrinkage, but would have been larger than they ever distributed. Our railways have, however, been content to go on working by the antiquated methods of thirty or forty years ago, and have neglected to take advantage of the experience of the American lines. This neglect has not only involved a very serious shrinkage in dividends in 1900, but it will probably mean the continuance of comparatively poor results for a considerable period; for improvements in railway working cannot be effected at a moment's notice.]

Before we proceed to prove the absence of progress in the scientific administration of our railways—for the purpose of showing the steps which should now be taken—we should in justice indicate the wide difference in their economical environment as compared with that of the railways of the United States. As most of our readers are aware, legislation in America has been directed to the stimulation of competition between the American lines. Every facility has been granted for the construction of new lines, and every impediment has been placed in the way of arrangements for the maintenance of rates. Railway pooling and agreements are absolutely prohibited. With rates constantly falling under the stimulus of intense competition, it was absolutely essential for the railways to reduce the cost of working to a corre-

sponding degree, as otherwise they would have been unable to pay the interest on their bonds or dividends on their stocks. This intense competition reduced railway rates, especially in the Eastern States of America, to an irreducible minimum, and has at length driven the American lines to combine on a vast scale. The effect of the amalgamations has been the more marked as, with the slightly higher rates now being secured, the railways are able to work more economically than before, and are consequently obtaining enormous profits. The conditions of railway working in this country have been the reverse of those in the United States. Here pooling is legal, and the railways are freely permitted to make whatever arrangements they consider advisable. The only serious restrictions are that the railways cannot raise their maximum rates without the sanction of Parliament, and cannot raise any rates in force without the sanction of the Railway Commissioners.

Thus, with the whole of the competitive traffic of the country pooled and rates maintained, the railways have hitherto had no stimulus to handle the traffic cheaply for the purpose of winning profits from low rates. Each company has, however, been desirous of carrying as much traffic as possible, as it receives a fixed portion of the receipts from competitive traffic for running expenses, &c., and is able to secure an additional profit from this

proportion of the total sum received. To secure this competitive traffic promises are made to deliver goods in the shortest space of time possible. Of course a large portion of the traffic is non-competitive. Nevertheless the system adopted has been to dispatch the traffic as speedily as possible, regardless of cost and regardless of whether or not an immense number of trucks, each containing a small consignment, would or would not congest the traffic, and delay delivery to a greater extent than by thoroughly sorting the traffic, loading the freight into as few waggons as possible, and running a smaller number of heavily loaded trains.

The effect of these widely varying conditions has been that whereas the American lines have enormously increased their train loads, and in many cases have nearly doubled them in the past ten years, the English lines have given little attention to the matter, and their train loads in 1900 were no heavier than they were in 1890 or 1880. Put briefly, the conditions prevailing in America are cheapness of transport combined with speed. In England they have been speed only, irrespective of economy.

That our railway managers have hitherto not appreciated the advantages of the American style of working has in some degree been due to their lack of information, and to their inability to make any contrast between the results obtained by their own

methods and those secured by American principles. To remove this drawback we have, since the article on the British Railway Position appeared in our issue of March 16,¹ taken a great deal of trouble to contrast the working results of our premier railway—the London and North-Western—with those of the first railway in the United States—the Pennsylvania.

THE LONDON AND NORTH-WESTERN

The London and North-Western, we need scarcely say, is administered on the most approved principles of English railway working, and its management deserves the high repute it holds. Its trains, both passenger and goods, are run with great punctuality, and the condition of its road-bed and rolling stock is beyond reproach. Moreover, as we shall presently show, the company is now, in some measure, appreciating the advantages of heavy train loading. Consequently, in selecting the North-Western we have chosen our premier line both from the point of view of the volume of its traffic, the largeness of its receipts, and the efficiency of its management.

The first difficulty which we had to overcome to make the comparisons we desired was the securing of the information needed. In our article of March 16¹

¹ This article, 'More Information Needed,' is reprinted herewith in Chapter VII., page 68.

we pointed out the need for the compilation and publication of additional information, beyond that now published in the companies' reports according to the statute. The published reports merely give the amount of the capital, earnings, expenses, and charges, with a statement of the train mileage. They contain no information whatever as to the average receipts per passenger per mile and per ton of freight per mile; no particulars as to the ton or passenger mileage, the train load, the car load, or the length of haul—all of which are essential to the administration of a railroad on modern scientific principles. Consequently we had to procure by various means the information we desired. The officials of the London and North-Western have answered our inquiries with great courtesy, and we tender to them our thanks for the considerable trouble they have taken to supply us with some of the information we needed. But in spite of the desire of the officials to assist us, we could not obtain the whole of the information we sought, and we have had, consequently, as we shall presently indicate, to estimate certain crucial figures. The reader may take it, however, that the estimates have been made after very careful consideration, and that the whole of the figures are practically correct.

PASSENGER MILEAGE AND PASSENGER TRAIN LOAD

The London and North-Western has a very large passenger traffic. The number of its passengers, excluding the season-ticket holders, amounted in 1900 to the immense total of nearly 87 millions. Nearly 80 millions were third class, only 5 millions were second, and less than 2 millions were first class. Compared with twenty years previously, the third class passengers have increased by nearly 100 per cent., the second class by 16 per cent., while the first class have declined by 24 per cent. The contrast of the number of passengers in 1900, 1890, and 1880 will be seen from the following :—

Number of Passengers

—	1880	1890	1900	Increase or Decrease, twenty years	
First class .	2,578,853	1,915,100	1,953,587	— 619,266	— 24·0
Second „ .	4,383,753	3,326,066	5,086,901	+ 703,143	+ 16·0
Third „ .	40,608,296	57,648,913	79,882,703	+ 39,274,407	+ 96·7
Season tickets .	32,099	57,650	101,171	+ 69,072	+ 215·2
Total .	47,603,006	62,947,729	87,030,362	+ 39,427,356	+ 82·8

Taking the average duration of the season tickets as three months, which appears to be the period, and assuming that each season-ticket holder travels 150 times in every three months, the total number of

B

passengers conveyed in 1900, including season-ticket holders, reached 102,000,000, against only 52,000,000 in 1880, a growth of nearly 95 per cent. in twenty years. This will be seen from the following :—

Total Number of Passengers

—	1880	1890	1900	Increase, twenty years	
Ordinary tickets .	47,570,907	62,890,070	86,929,191	39,358,284	% 82·7
Season tickets .	4,814,850	8,647,500	15,175,650	10,360,800	215·2
Total .	52,385,757	71,537,579	102,104,841	49,719,084	94·9

The receipts from passengers in 1900 were 4,768,000*l.*, of which 3,379,000*l.* were derived from third class, 544,000*l.* from first class, 515,000*l.* from second class, and 329,000*l.* from season tickets. The contrast of these receipts with those of 1890 and 1880 is as follows :—

Receipts from Passengers

—	1880	1890	1900	Increase or Decrease, twenty years	
	£	£	£	£	%
First class .	564,152	522,851	544,695	— 19,457	— 3·4
Second „ .	436,501	331,566	515,025	+ 78,524	+ 18·0
Third „ .	1,943,765	2,730,397	3,379,314	+ 1,435,549	+ 73·8
Season tickets .	112,159	194,485	329,438	+ 217,279	+ 194·0
Total .	3,056,577	3,779,299	4,768,472	+ 1,711,895	+ 56·0

To determine whether or not a railway is administered with due efficiency and economy it is essential to know how many passengers it carries on an average in each train, and for this purpose it is necessary to ascertain the average rate paid per passenger per mile and the average number of passengers carried one mile. The Company's passenger charges have not varied materially during the past twenty years, except in respect to second-class fares, in which a reduction was made in 1897 from 1.25*d.* to 1.10*d.* per mile for single fares, and from 2.39*d.* to 2.20*d.* per double mile on return fares. The average fares charged by the Company for first, second, and third class passengers for season tickets in 1880, 1890, and 1900 have been as follows :—

Average Rate per Passenger per Mile

—	1880	1890	1900
	<i>d.</i>	<i>d.</i>	<i>d.</i>
First class . .	1.70	1.70	1.70
Second „ . .	1.22	1.22	1.10
Third „ . .	.90	.90	.90
Season tickets .	.35	.35	.35
Total . . .	.96	.90	.87

The season-ticket rate has been ascertained by assuming that the holder of the season ticket travels for about 300 days of the year. Having thus obtained the average rate per passenger per mile,

we are now able to ascertain the number of passengers carried one mile. The result of our calculation is as follows :—

Number of Passengers Carried One Mile

—	1880	1890	1900	Increase or Decrease, twenty years	
					%
First class .	79,645,000	73,814,000	76,897,000	— 2,748,000	— 3·4
Second „ .	85,869,000	65,219,000	112,342,000	+ 26,473,000	+ 30·8
Third „ .	518,337,000	728,106,000	901,150,000	+ 382,813,000	+ 73·8
Season tickets	76,909,000	133,361,000	225,900,000	+ 148,991,000	+ 193·7
Total	760,760,000	1,000,500,000	1,316,289,000	+ 555,529,000	+ 73·0

It will be seen from the above that out of a total of 1,316,000,000 passengers carried one mile only 76,000,000 were first class, that not more than 112,000,000 were second class, that 226,000,000 represent season-ticket holders, and that as many as 901,000,000 were third class passengers. The bulk of the season tickets were first and second class, and to ascertain the total number of first and second class passengers it is necessary to include the season tickets. To provide first and second class accommodation to season-ticket holders on the basis of nearly three miles for a penny does not appear to be a very profitable business; but a large season-ticket traffic means full trains, and full trains mean low cost per passenger. Moreover, season-ticket holders create a large amount of both general passenger and goods traffic. Compared with 1880, the

number of passengers carried in 1900 one mile increased by 73 per cent. The train miles run to carry these passengers were as many as 26,624,000 in 1900, and 16,703,000 in 1880. In twenty years the increase in train mileage was thus nearly 60 per cent. The contrast of the passenger train miles in 1880, 1890, and 1900 is as follows :—

Passenger Train Mileage

—	1880	1890	1900	Increase, twenty years	
Train mileage	16,703,000	21,611,000	26,624,000	9,921,000	% 59·4

The number of passengers carried per train, in spite of the enormous growth of 73 per cent. in twenty years, was only slightly larger in 1900 than in 1890 or in 1880, the number in 1900 being only 49·4 passengers per train, against 46·3 in 1890 and 45·6 in 1880. That is to say, the average passenger train load in 1900 was still no more than sufficient to fill one carriage instead of a train, or, allowing for the traffic moving chiefly in one direction, thereby doubling the number of passengers per loaded train, sufficient to fill two carriages. Although the North-Western is rightly desirous of affording to the public an admirable passenger service, there is surely a good deal of waste mileage when the average number of passengers per train is so low; and it should be borne in mind that the average passenger earnings

of the North-Western per train are higher than those of any other of our great railways. Apart from season tickets, the average number of first class passengers per train is less than three, the average number of second class passengers is only 4.2, and the average number of third class passengers is only 33.8. Including season tickets, the number of passengers carried per train is only 49.4. When we consider the large sums spent upon upholstering and fitting the first and second class carriages, there seems reason to question the advisableness of continuing the system of passenger working on existing methods. Below we contrast the number of passengers carried per train mile in 1880, 1890, and 1900, together with the number in each class:—

Number of Passengers Carried per Train Mile

—	1880	1890	1900
First class	4.8	3.4	2.9
Second „	5.2	3.0	4.2
Third „	31.0	33.7	33.8
Season tickets	4.6	6.2	8.5
Total	45.6	46.3	49.4

By dividing the number of passengers into the passenger mileage we find that the average distance travelled per passenger is only 12.8 miles, as against nearly 14.4 miles in 1890 and 14.5 miles in 1880.

The Company earns a very large sum of money

by carrying parcels, mails, &c., in its passenger trains ; and to arrive at the earnings per passenger train mile it is necessary to include the receipts from these sources. In 1900 the amount received from parcels, mails, &c., was 1,225,000*l.*, whereas in 1880 the sum was only 646,000*l.* These miscellaneous receipts have thus nearly doubled in twenty years. The receipts from parcels, mails, &c., represent over one-fifth of the total earnings from the running of passenger trains. But including these miscellaneous receipts, the total earnings per passenger train mile are still only 54*d.*, as against 52·4*d.* in 1890 and 53·2*d.* in 1880. Of this sum the earnings from passengers per train mile have been only 43*d.* in 1900, against 42*d.* in 1890 and 43·9*d.* in 1880 ; and the earnings from parcels, mails, &c., per train mile have been 11*d.* in 1900, against 10·4*d.* in 1890 and 9·3*d.* in 1880. Surely it would have been possible to give an excellent service without increasing the number of trains to such an extent that the earnings per passenger train mile should be practically no larger now than they were twenty years ago, in spite of the enormous increase in the number of passengers and in the quantity of parcels, mails, &c. That the reader may easily understand the position of the passenger traffic in 1900, compared with 1890 and 1880, we recapitulate below the number of passengers, the passenger train

mileage, the number of passengers per train mile, the average distance travelled per passenger, the rate per passenger per mile, the receipts from passengers and from parcels, the total earnings of passenger trains, the average rate received per passenger mile and passenger earnings per passenger train, the receipts from parcels, mails, &c., per passenger train mile, and the total earnings per passenger train mile :—

Passenger Train Results

—	1880	1890	1900	Increase or Decrease, twenty years	
Passenger mileage	760,760,000	1,000,500,000	1,316,289,000	+ 555,529,000	+ 73·0
Train mileage . .	16,702,894	21,611,499	26,624,498	+ 9,921,604	+ 59·4
No. of passengers per train mile .	45·6	46·3	49·4	+ 3·8	+ 8·3
No. of passengers .	52,385,757	71,587,579	102,104,841	+ 49,719,084	+ 94·9
Average distance travelled (miles)	14·5	14·4	12·8	— 1·7	— 8·8
Rate per passenger per mile . . .	·96 <i>d.</i>	·90 <i>d.</i>	·87 <i>d.</i>	— ·09 <i>d.</i>	— 9·3
Receipts from passengers . . .	£ 3,056,577	£ 3,779,299	£ 4,768,472	+ 1,711,895	+ 56·0
Receipts from parcels, mails, &c. .	646,584	932,613	1,225,004	+ 578,420	+ 89·5
Total earnings, passenger trains	3,703,161	4,711,912	5,993,476	+ 2,290,315	+ 61·8
Passenger earnings per passenger train . . .	<i>d.</i> 43·9	<i>d.</i> 42·0	<i>d.</i> 43·0	— 0·9	— 2·0
Parcels, mails, &c.	9·3	10·4	11·0	+ 1·7	+ 18·2
Total earnings per passenger train mile.	53·2	52·4	54·0	+ 0·8	+ 1·5

TON MILEAGE AND FREIGHT TRAIN LOAD

The practice of increasing the passenger trains in proportion to the growth in the number of passengers has also been followed as regards the goods traffic. The average quantity of goods carried per truck and per train is the same as it was twenty years ago. The cars on our railways are of exceedingly small capacity. Trucks are often run with loads of less than a ton, and trucks with a load of 10 tons are the exception. The American lines move a large number of cars with a capacity of 50 tons. The revenue derived by the London and North-Western from merchandise, live stock, and minerals in 1900, compared with 1890 and 1880, will be seen from the following:—

Revenue from Goods Traffic

--	1880	1890	1900	Increase, twenty years	
	£	£	£	£	%
Merchandise . .	3,505,467	3,999,875	4,491,091	985,624	28.1
Live stock . . .	200,346	228,553	225,771	25,425	12.6
Minerals . . .	2,215,749	2,433,087	2,915,006	699,257	31.5
Total	5,921,562	6,661,515	7,631,868	1,710,306	28.8

The increase in the twenty years has been 1,710,000*l.*, or nearly 29 per cent. The only information as to the practical working of this traffic given in the report is the extent of the freight train mileage. This information is, of course, practically valueless without the average earnings per ton per mile. After

careful estimate we have arrived at the following average rates per ton per mile for merchandise, live stock, and minerals :—

Estimated Averages, Rates per Ton per Mile of the London and North-Western Railway

—	1880	1890	1900
	Pence 2	Pence 2	Pence 2
Merchandise	3·5	3·5	3·5
Live stock	·7	·7	·7
Minerals			
Average rate per ton per mile .	1·190	1·202	1·189

We would recall that in 1892 a revision of the railway rates occurred, and that a general increase of 5 per cent. was made in the charges for most classes of traffic. As, however, it is quite impossible to ascertain with any exactness the effect of this increase in rates upon the Company's average charges, we have assumed that the average rates received for the three classes of traffic have been the same in the three years. By the aid of these figures we are able to arrive at the ton miles for the three classes of traffic, and these we set out below in 1880, 1890, and 1900 :—

Ton Miles

—	1880	1890	1900	Increase, twenty years	
					%
Merchandise	420,656,000	479,985,000	538,931,000	118,275,000	28·1
Live stock .	13,737,000	15,676,000	15,481,000	1,744,000	12·7
Coal . . .	759,685,000	834,201,000	995,144,000	235,459,000	31·0
Total . .	1,194,078,000	1,329,862,000	1,549,556,000	355,478,000	29·8

This ton mileage involved the running of 22,598,000 train miles in 1900, a little over 20,000,000 in 1890, and 18,200,000 in 1880. Thus an increase in the ton mileage of about 30 per cent. was attended by an increase in goods train mileage of nearly 24 per cent., and the average train load apparently increased from 65·6 tons in 1880 to 68·6 tons in 1900. Taking into account the increase in rates in 1892, there has, however, been little or no increase in the average train load. That is to say, our railways have been content to move exactly the same load per train as they did twenty years ago. Below we set out the contrast of the tonnage, the goods train mileage, the ton mileage, and the average train load in 1880, 1890, and 1900, to show, first, how exceedingly small is the average train load, and, secondly, that the load is little, if any, larger than it was twenty years ago.

Comparison—Tonnage, Mileage, and Train Loads

—	1880	1890	1900	Increase, twenty years	
Tonnage . . .	32,706,278	37,358,724	44,465,277	11,758,999	35·9
Train mileage .	18,209,893	20,287,911	22,598,619	4,388,726	24·1
Ton mileage .	1,194,078,000	1,329,851,000	1,549,556,000	355,478,000	29·8
Average train load, tons .	65·6	65·5	68·6	3·0	4·5

To supplement the above we contrast the earnings from goods traffic, the rate per ton per

mile, the average length of haul, and the goods earnings per train mile in 1880, 1890, and 1900 :—

Goods Train Results

—	1880	1890	1900	Increase or Decrease, twenty years	
				£	%
Merchandise, live stock, and mineral earnings . . .	£ 5,921,562	£ 6,661,515	£ 7,631,868	+ 1,710,306	+ 28·8
Rate per ton per mile	1·190 <i>d.</i>	1·202 <i>d.</i>	1·189 <i>d.</i>	— ·001 <i>d.</i>	—
Average length of haul (miles) . .	36·5	35·6	34·8	— 1·7	— 4·6
Earnings per train mile	78 <i>d.</i>	79 <i>d.</i>	81 <i>d.</i>	+ 3 <i>d.</i>	+ 3·8

It will be noted that the average haul was 34·8 miles, against 36·5 miles in 1880.

Having thus shown that our railways, as typified by the London and North-Western, whose management is of the best, have made practically no progress in the economical handling of either passenger or goods traffic in the past twenty years, we propose to show the enormous reduction in costs effected by American lines under the stress of competition. We make the contrast with the Pennsylvania to show what can be accomplished by close attention to loading, for which the American lines have now become famous. It would, of course, be quite impossible for the Pennsylvania to handle goods and mineral traffic profitably if it did not move its traffic in vast train loads. The Pennsylvania's average

train load is 484·6 tons; the North-Western's is 68·6 tons. Of course the Pennsylvania has to run many light trains, but, on the other hand, it is able to move trains of a gross weight of upwards of 2,000 tons. Hence its high average. Heavy train loads mean a low cost per ton. First, the expenditure upon wages for the engine driver, stoker, and guard are the same whether the train be a light or a heavy one. Secondly, heavily loaded cars reduce the proportion of dead weight to the gross weight of the train, compared with the dead weight of lightly loaded cars, and less fuel is required to move a given weight of goods. Thirdly, the wear and tear to the line is diminished by the smaller number of trains necessary to handle the traffic, for the greater portion of the wear and tear to the rails arises from stoppages, and the fewer the number of trains the fewer are the stoppages, both by reason of the reduced number of trains and of the less congested state of the road. Fourthly, the total sum required for maintenance of locomotives and waggons is greatly reduced, as a much smaller number of locomotives and waggons are required for handling the traffic. Fifthly, with a smaller number of trains there is less congestion of traffic, and consequently less delay and less waste.

The fact that goods can be economically handled in heavy train loads accounts for the ability of the

American lines to carry traffic at rates which would mean bankruptcy to the railways of this country. For 1900 the average rate per ton per mile secured by the Pennsylvania and its lines east of Pittsburg was only $\cdot 27d.$ —that is to say, about one farthing per ton per mile; while the average rate secured by the London and North-Western was $1\cdot 189d.$ per mile, or nearly five farthings. In other words, the North-Western's average rate was nearly four and a half times greater than the Pennsylvania's. Nevertheless, the Pennsylvania Railroad secured such an enormous traffic at the low rates, and was able to carry the traffic so cheaply, that the proportion of its transportation expenses to its gross receipts was over 2 per cent. lower than that of the London and North-Western. Transportation expenditure, we should state, is the actual cost of moving the traffic, exclusive of the sums spent on maintenance of way and equipment and general charges of the administration. But we must defer until the next chapter the detailed contrast of the cost of moving light and heavy train loads.

CHAPTER II

COST OF MOVING TRAFFIC IN ENGLAND AND AMERICA
COMPARED

IN the last chapter we showed that British passenger and goods trains were loaded no more heavily in 1900 than they were in 1880, and that in consequence of this absence of progress the comparison of what our lines can accomplish in the way of handling traffic economically with what is done by American lines is very unfavourable—is, indeed, deplorable. We shall now prove that not only have our lines effected no economies in the cost of moving a passenger or a ton of goods, but that the cost is now much greater than it was in 1880, and that American lines have effected a very great reduction in the cost of handling both passengers and goods. Doubtless the high price of coal and material ruling here last year as compared with 1880 partially accounts for the increased relative cost of moving traffic compared with twenty years ago ; but it must be remembered that trade in the United States last year was also active, and prices relatively high, and

that the allowance which should be made for the higher prices ruling here than in the United States is, consequently, small. The fact of the matter is that wages and other costs have risen during the past twenty years, and that until now British companies have been content to meet the advance in wages out of the profits arising from the additional traffic, instead of increasing the efficiency of the dearer labour by a more skilful and more economical handling of the traffic. The question of economical railway working has, however, now become a matter of the first importance, both to the companies themselves and to the country, and it is essential for those responsible for the management of the lines to take immediate and effective measures to reduce the present extremely heavy cost of carriage. It is scarcely necessary for us to indicate the important part that the cost of railway carriage plays in the cost of production, nor to point to the immense advantages derived by our American competitors in the manufacture and marketing of their products and produce from the extremely low rates now charged by American lines. Everyone is, or should now be, fully alive to the seriousness of the competition which our manufacturers have to face in the free markets of the world owing to the cheapness with which American manufacturers can now produce and ship, and everyone should realise that our ability to hold our own

depends not only upon the adoption by our manufacturers of the most approved and economical methods of producing goods, but upon the ability of our railway managers to reduce the cost of carriage and to make concessions in rates. It is useless to hide from ourselves that we are face to face with a critical period in the country's history, that our pre-eminence in manufactures is being seriously contested, that we have now to meet competition where previously we had customers; that America, Germany and Belgium are pushing us hard in the supply of iron and steel goods; that American bridges and American machinery have now as good, and apparently a better market than our own; that the manufacture of cotton goods is growing very rapidly in the States, on the Continent, in India, and in Japan; and that we cannot fail to feel with increasing effect the ability of our competitors to produce more cheaply than ourselves. The progress of the United States industries, largely by reason of their possession of very cheap railway facilities, is undoubtedly causing uneasiness to those aware of the true state of affairs. The prosperity of our railways is bound up in the prosperity of the country; and if our trade suffers by reason of the failure of our railways to institute that economy in handling traffic which has been so successful in the States, the railways will suffer severely. They will, indeed, probably suffer

to a much greater extent than any other industry. The traders of this country are well aware that economical railway working in the United States has been brought about by the stimulation of competition among the lines, and should our trade suffer by reason of high railway rates and absence of railway economy it is not only possible, but probable, that an attempt will be made to prohibit pooling and traffic arrangements after the manner of the American law. And who knows whether or not the attempt may not be successful, in view of the present attitude of the Government and of the people of this country towards private trading? When we see even a Conservative Government encouraging competition in the ocean telegraphs and in the telephones, and devoting the public money to forcing a reduction in ocean telegraph rates and in telephone charges, who can tell what may be done if our railways should arouse the antagonism of the great trading classes of the community by failure to effect savings in the cost of railway carriage and to make any reduction in rates when traders are hard pressed by competition? We trust, therefore, that the railways in their own interest will themselves move quickly in the matter, and effect economies.

To what extent the train loads of this country can be increased is difficult to determine. To expect railways to increase their train loads to the level of

the Pennsylvania's 484 tons is not reasonable; but that they can make a vast addition to an average load of 68 tons is beyond doubt.

THE LONDON AND NORTH-WESTERN'S TRAIN LOADS AND
EXPENSES PER TON PER MILE CONTRASTED WITH
THE PENNSYLVANIA'S

Now let us see what economies the Pennsylvania has effected in moving a ton of goods one mile in 1900 compared with 1880, and what has been the increase in the cost of moving a ton of goods one mile on the London and North-Western.

In 1880 the Pennsylvania was able to move a ton of goods at a cost of $\cdot 27d.$; in 1900 the cost was only $\cdot 181d.$, a reduction of 33 per cent. In 1880 the cost of moving a ton of goods on the North-Western was $\cdot 554d.$; in 1900 it was $\cdot 686d.$, an increase of 24 per cent. Thus the cost of moving a ton of goods by the Pennsylvania has been *reduced* by 33 per cent., while on the North-Western the cost has *risen* by nearly 24 per cent. in twenty years. To show the striking nature of the contrast we give below the average rate per ton per mile secured by the Pennsylvania in 1900 and 1880, the average expenses per ton per mile, and the net earnings per ton per mile:—

Pennsylvania's Earnings and Expenses per Ton per Mile

—	1900	1880	Decrease, twenty years	
	<i>d.</i>	<i>d.</i>	<i>d.</i>	%
Receipts per ton per mile . .	·270	·459	·189	41·2
Expenses per ton per mile . .	·181	·270	·089	32·9
Net earnings per ton per mile .	·089	·189	·100	52·9

And, secondly, the London and North-Western's gross earnings, expenses, and net earnings per ton per mile in the two years:—

London and North-Western's Earnings and Expenses per Ton per Mile

—	1900	1880	Increase or De- crease, 20 years	
	<i>d.</i>	<i>d.</i>	<i>d.</i>	%
Receipts per ton per mile . .	1·189	1·190	—·001	—
Expenses per ton per mile . .	·686	·554	+·132	+23·8
Net earnings per ton per mile .	·503	·636	—·133	—20·9

To bring out the lesson more clearly we now contrast the cost of moving a ton one mile on the Pennsylvania and on the London and North-Western in 1880 and in 1900:—

Cost of Moving a Ton One Mile

—	Pennsyl- vania	London & N. Western	Difference against the North-Western	
	<i>d.</i>	<i>d.</i>	<i>d.</i>	%
1880	·270	·554	+·284	+105
1900	·181	·686	+·505	+279
Movement	—·089	+·132	+·221	—
Per cent.	—23·9	+23·8	+77·7	—

Hence, whereas the cost in 1880 of moving a ton of goods on the London and North-Western, compared with the Pennsylvania, was 105 per cent. greater, in 1900 it was 279 per cent. greater.

In the light of these figures the following comparison of the freight working results secured by the Pennsylvania and by the North-Western in 1900 should be studied very closely :—

*The Pennsylvania and London and North-Western
Freight Results Contrasted*

—	Pennsylvania Rail- road	London & North- Western	Difference of the North- Western's contrasted with the Pennsylvania's results	
Number of tons carried 1 mile .	11,528,463,000	1,549,556,000	- 10,698,893,000	— % 87·5
Freight train mileage . .	23,830,000	22,598,000	- 1,232,000	— 5·1
Train load freight (tons) .	484·6	68·6	- 416·0	— 85·9
Tonnage . .	104,190,000	44,465,000	- 59,725,000	— 57·3
Length of haul, goods (miles) .	110·1	34·8	- 75·3	— 68·4
Average rate per ton per mile .	·270 <i>d.</i>	1·189 <i>d.</i>	+ ·919 <i>d.</i>	+ 340·4
Average cost per ton per mile .	·181 <i>d.</i>	·686 <i>d.</i>	+ ·505 <i>d.</i>	+ 279·0
Receipts per freight train mile . .	130 <i>d.</i>	81 <i>d.</i>	- 49 <i>d.</i>	— 37·7
Miles of railway	2,958·56	1,930·25	- 1,028·31	— 34·8
Ton mileage per mile of rail- way ¹ . .	3,896,646	802,774	- 3,093,872	— 79·4
Freight train mileage per mile of railway	8,054	11,707	+ 3,653	+ 45·3

¹ Density of traffic.

Thus the London and North-Western runs nearly as many train miles to move 1,500,000,000 tons one mile as the Pennsylvania does to move 11,500,000,000 tons one mile. The North-Western runs an average of 11,700 trains over one mile of its road to move an average of 802,000 tons over one mile of road, while the Pennsylvania runs an average of only 8,000 trains over one mile of its road to move 3,896,000 tons over one mile of road. In other words, the North-Western runs 45 per cent. more trains over one mile of its road to carry 79 per cent. less traffic per mile. All this is of course indicated by the statement that the average freight train load of the North-Western is only 68·6 tons against the 484·6 tons of the Pennsylvania. Further, it must be borne in mind that the North-Western freight trains are loaded more heavily than those of any other railway in this country, with the exception of the Lancashire and Yorkshire, and that the contrast of the working results of other freight lines with those of the Pennsylvania would be still more unfavourable.

THE LONDON AND NORTH-WESTERN'S EXPENSES PER
PASSENGER PER MILE AND THE PENNSYLVANIA'S

Somewhat similar movements in the cost of transporting passengers in England and in the United States have occurred. The cost in 1880 of carrying a passenger one mile by the Pennsylvania was $\cdot 837d.$; in 1900 it was reduced to $\cdot 726d.$ On the other hand, the North-Western's cost per passenger rose from $\cdot 478d.$ to $\cdot 573d.$ Thus, the Pennsylvania *reduced* its cost of carrying a passenger by 13 per cent., and the North-Western *increased* its cost by $11\frac{1}{2}$ per cent.

The reduction in the cost of moving a passenger on the Pennsylvania in 1900, compared with 1880, will be seen from the following contrast of the rate received, the expenses, and the net earnings per passenger per mile :—

Pennsylvania's Earnings and Expenses per Passenger per Mile

—	1900	1880	Decrease, twenty years	
	d.	d.	d.	%
Earnings received per passenger per mile	$\cdot 990$	$1\cdot 111$	$\cdot 121$	10·9
Expenses per passenger per mile	$\cdot 726$	$\cdot 837$	$\cdot 111$	13·2
Net earnings per passenger per mile	$\cdot 264$	$\cdot 274$	$\cdot 010$	3·6

The contrast of the average earnings per passenger per mile, expenses, and net earnings of the London

working results secured by the Pennsylvania and by the London and North-Western :—

The Pennsylvania and London and North-Western Passenger Results Contrasted

—	Pennsylvania Railroad	London and North-Western	Differences of the North-Western's contrasted with the Pennsylvania's results	
				%
No. of passengers carried one mile	886,164,000	1,316,289,000	+ 430,125,000	+ 48·5
Passenger train mileage . . .	16,234,000	26,624,000	+ 10,490,000	+ 64·6
No. of passengers per train . . .	54·5	49·4	— 5·1	— 9·3
No. of passengers carried . . .	40,635,000	102,105,000	+ 61,470,000	+ 151·2
Average distance travelled (miles)	21·8	12·8	— 9·0	— 41·3
Average fare per passenger per mile	·990 <i>d.</i>	·869 <i>d.</i>	— ·121	— 12·2
Average cost per passenger per mile	·726 <i>d.</i>	·533 <i>d.</i>	— ·193	— 26·7
Receipts per passenger train mile	65·7 <i>d.</i>	54·0 <i>d.</i>	— 11·7	— 17·8
Miles of railway .	2958·56	1,930·25	— 1,028·31	— 34·8
Passenger mileage per mile of railway ¹	299,000	682,000	+ 383,000	+ 128·1
Passenger train mileage per mile of railway . .	5,487	13,793	+ 8,306	+ 151·3

¹ Density of traffic.

Thus the North-Western passenger train load was only 49·4 passengers per mile as against the 54·5 of the Pennsylvania—a difference of over 9 per

*Comparison of Earnings and Expenses of Pennsylvania
Railroad and London and North-Western*

—	Pennsylvania	London and North- Western	Increase or Decrease L. & N.-W. compared with Pennsylvania	
GROSS EARNINGS—	£	£	£	%
Freight receipts .	12,952,000	7,632,000	- 5,320,000	-41.1
Passenger receipts .	3,656,900	4,768,000	+ 915,000	+ 23.7
Parcels, mails, &c. .	684,000	1,225,000	+ 541,000	+ 79.2
Miscellaneous .	536,000	258,000	- 81,000	-23.9
Total earnings .	17,828,000	13,883,000	- 3,945,000	-22.1
EXPENSES—				
Maintenance of way	2,219,000	1,301,000	- 918,000	-41.4
Maintenance of equipment . .	2,702,000	1,168,000	- 1,534,000	-56.8
Transportation ex- penses . . .	6,312,000	5,242,000	- 1,070,000	- 16.9
General charges .	400,000	383,000	- 12,000	- 3.0
Total expenses .	11,633,000	8,099,000	- 3,534,000	-30.3
NET EARNINGS .	6,195,000	5,784,000	- 411,000	- 6.6

Ratio of Expenses to Receipts

—	Pennsyl- vania	L. & N.-W.	Increase or Decrease, L. & N.-W. compared with Pennsylvania
	%	%	%
Maintenance of way . .	12.45	9.37	- 3.08
Maintenance of equipment .	15.16	8.41	- 6.75
Transportation expenses .	35.40	37.76	+ 2.36
General charges . . .	2.24	2.79	+ .55
Total expenses . .	65.25	58.33	- 6.92

much more than one-eighth of the quantity of goods carried by the Pennsylvania, and not more than one-half more passengers one mile. Assuming that the work in moving a ton of goods is as great as moving one passenger one mile—and the English railways calculate that it costs more to move a ton of goods than a passenger—the amount of work performed by the Pennsylvania would be four and a half times greater than that performed by the London and North-Western.

To compare the relative cost of working the two lines in proportion to the work performed, it is necessary to ascertain what would be the earnings of the two Companies if both received the same average rate per passenger and per ton of goods, and if both had similar lengths of haul, and then to calculate the ratios of expenses to earnings. Assuming that the Pennsylvania received the same rate per ton per mile as the North-Western— $1.189d.$, in place of $.27d.$ —its receipts from goods would have been 340 per cent. more than they were. In other words, they would have amounted to $57,111,000l.$, against the actual sum received of $12,952,000l.$ On the other hand, the Pennsylvania's passenger earnings would have been 12 per cent. less— $3,212,000l.$, against the actual $3,656,000l.$ —had it received the North-Western's average rate of $.87d.$ in place of its own average of $.99d.$ per passenger per mile. Assuming that

*Comparison of Earnings and Expenses of Pennsylvania
Railroad and London and North-Western*

—	Pennsylvania	London and North- Western	Increase or Decrease L. & N.-W. compared with Pennsylvania	
GROSS EARNINGS—	£	£	£	%
Freight receipts .	12,952,000	7,632,000	— 5,320,000	— 41·1
Passenger receipts .	3,656,900	4,768,000	+ 915,000	+ 23·7
Parcels, mails, &c. .	684,000	1,225,000	+ 541,000	+ 79·2
Miscellaneous .	536,000	258,000	— 81,000	— 23·9
Total earnings .	17,828,000	13,883,000	— 3,945,000	— 22·1
EXPENSES—				
Maintenance of way	2,219,000	1,301,000	— 918,000	— 41·4
Maintenance of equipment . .	2,702,000	1,168,000	— 1,534,000	— 56·8
Transportation ex- penses . . .	6,312,000	5,242,000	— 1,070,000	— 16·9
General charges .	400,000	383,000	— 12,000	— 3·0
Total expenses .	11,633,000	8,099,000	— 3,534,000	— 30·3
NET EARNINGS .	6,195,000	5,784,000	— 411,000	— 6·6

Ratio of Expenses to Receipts

—	Pennsyl- vania	L. & N.-W.	Increase or Decrease, L. & N.-W. compared with Pennsylvania
	%	%	%
Maintenance of way . .	12·45	9·37	— 3·08
Maintenance of equipment .	15·16	8·41	— 6·75
Transportation expenses .	35·40	37·76	+ 2·36
General charges . . .	2·24	2·79	+ ·55
Total expenses . .	65·25	58·33	— 6·92

much more than one-eighth of the quantity of goods carried by the Pennsylvania, and not more than one-half more passengers one mile. Assuming that the work in moving a ton of goods is as great as moving one passenger one mile—and the English railways calculate that it costs more to move a ton of goods than a passenger—the amount of work performed by the Pennsylvania would be four and a half times greater than that performed by the London and North-Western.

To compare the relative cost of working the two lines in proportion to the work performed, it is necessary to ascertain what would be the earnings of the two Companies if both received the same average rate per passenger and per ton of goods, and if both had similar lengths of haul, and then to calculate the ratios of expenses to earnings. Assuming that the Pennsylvania received the same rate per ton per mile as the North-Western— $1.189d.$, in place of $.27d.$ —its receipts from goods would have been 340 per cent. more than they were. In other words, they would have amounted to $57,111,000l.$, against the actual sum received of $12,952,000l.$ On the other hand, the Pennsylvania's passenger earnings would have been 12 per cent. less— $3,212,000l.$, against the actual $3,656,000l.$ —had it received the North-Western's average rate of $.87d.$ in place of its own average of $.99d.$ per passenger per mile. Assuming that

the earnings from parcels, &c., would have been the same as they were, the total gross earnings of the Pennsylvania, had it received similar rates to those of the North-Western, would have been £1,502,000*l.*, against the actual sum secured of only 17,828,000*l.*

On the other hand, the expenditure of the Pennsylvania would have been larger than it was had its average haul per ton of freight and per passenger been no greater than the North-Western's. The expenditures upon maintenance of way and maintenance of equipment would probably have been no greater than they were. These expenditures are chiefly governed by the weight of the train loads and the train mileage, and the loads of the trains would probably have been as great—perhaps greater—were the average haul shorter and the ton mileage as large, while the train mileage would have been no larger, and probably would have been smaller. The expense of handling traffic at terminals would, however, have been greater, as a shorter haul would mean that a larger tonnage would have to be loaded into the trains to give an equal ton mileage. That is to say, if the Pennsylvania Railroad with its traffic of 11,548,000,000 tons carried one mile (ton mileage) had had an average haul of only 34.8 miles—the North-Western's—its tonnage would have been nearly 332,000,000 tons instead of 104,200,000 tons, and the expense of handling the freight traffic at the terminals

would have been increased by 216 per cent. As the cost of handling 104,000,000 tons of freight at the terminals of the Pennsylvania was about 1,600,000*l.*, the cost of handling 332,000,000 tons would at the same rate have been about 5,100,000*l.* Further, if the Pennsylvania with its traffic of 886,164,000 passengers carried one mile (passenger mileage) had had an average haul per passenger of only 12·7 miles—the North-Western's—in place of 21·8 miles the number of passengers carried would have been nearly 69,800,000 in place of 40,600,000, and its terminal charges for passenger traffic would have been increased by 71·7 per cent., from about 500,000*l.* to 860,000*l.* Thus the addition to the cost at the terminals of handling the larger tonnage would have been about 3,500,000*l.*, and of handling the greater number of passengers at the stations would have been 360,000*l.*

The Pennsylvania's expenses of conducting transportation (locomotive fuel, wages for working the trains, light for trains, signalling, terminal expenses, superintendence, &c.) in 1900 was 6,312,000*l.* If we add to this the additional 3,860,000*l.* which represents the *pro rata* increase in the cost at the terminals of handling the much larger tonnage and greater number of passengers, as explained, the cost of conducting transportation would still be only 10,172,000*l.* The results which the Pennsylvania would have secured had it received as high rates per

ton per mile for freight and as low fares per passenger per mile as the North-Western, and had no greater length of haul, are as follows :—

Comparison of the Earnings and Expenses of the Pennsylvania Railroad with the London and North-Western's, on the basis of its having received similar average rates per ton and per passenger per mile and having a similar length of haul

—	Pennsylvania ¹	London and North-Western	Increase or Decrease, L. & N.-W. compared with Pennsylvania	
GROSS EARNINGS—				
	£	£	£	%
Goods . . .	57,111,000	7,632,000	— 49,479,000	— 86·6
Passengers . .	3,212,000	4,768,000	+ 1,356,000	+ 48·5
Parcels, mails, &c. . . .	657,000	1,225,000	+ 568,000	+ 86·4
Miscellaneous .	522,000	258,000	— 264,000	— 102·3
Total . . .	61,502,000	13,883,000	— 47,619,000	— 77·4
EXPENSES—				
Maintenance of way . . .	2,219,000	1,301,000	— 918,000	— 41·4
Maintenance of equipment .	2,702,000	1,168,000	— 1,534,000	— 56·8
Transportation expenses .	10,172,000	5,240,000	— 4,932,000	— 48·5
General charges	400,000	388,000	— 12,000	— 3·0
Total expenses	15,493,000	8,097,000	— 7,396,000	— 47·7
NET EARNINGS .	46,009,000	5,786,000	— 40,223,000	— 87·6

¹ Dollar taken at 4s. 2d. and the cent at $\frac{1}{2}$ d.

Thus, had the Pennsylvania Railroad secured rates equal to those of the North-Western, and had its length of haul been no longer, it would have secured a profit of 46,000,000*l.* against its actual profit of

6,195,000*l.* That is to say, by reason of its heavy train loads and cheap method of handling traffic at the terminals, it was able to handle over four and a half times the traffic at less than double the expenditure.

To show how low was the expenditure of the Pennsylvania in proportion to its traffic as compared with the North-Western's, we contrast below the ratios of the Pennsylvania adjusted to the basis of the North-Western's, and the actual ratios of the North-Western :—

Comparison of the Ratios of Expenses to Gross Earnings of the Pennsylvania and London and North-Western, on basis of similar rates and lengths of haul

—	Pennsylvania	North-Western	Difference against North-Western
	%	%	%
Maintenance of way	3·61	9·37	+ 5·76
Maintenance of equipment . .	4·40	8·41	+ 4·41
Transportation expenses . . .	16·54	37·76	+ 21·22
General charges .	·65	2·79	+ 2·14
Total expenses .	25·20	58·33	+ 33·13

This comparison means that if the North-Western in 1900 carried as heavy train loads of freight and passengers as the Pennsylvania its expenses would have been only 3,500,000*l.* against its existing expenditure of 8,100,000*l.*, its net earnings would

D

have been 10,400,000*l.* in place of 5,800,000*l.*, and its profits for ordinary stock in 1900 would have been 7,200,000*l.* instead of 2,600,000*l.*—a difference of no less than 4,600,000*l.*

The calculation of what the North-Western's expenses, net earnings and net profits would have been in 1900 if it had worked as economically as the Pennsylvania will perhaps be grasped more readily if tabulated:—

London and North-Western's Expenses, Net Earnings and Net Profits if the railway were worked as economically as the Pennsylvania Railroad

—	At Pennsyl- vania's rate of working	Actual	Improvement %	
	£	£	£	%
Gross earnings .	13,883,000	13,883,000	—	—
Expenses . .	3,498,000	8,099,000	- 4,601,000	- 56·8
Ratio of expenses to receipts .	25·20	58·33	- 33·13	—
Net earnings .	10,385,000	5,784,000	+ 4,601,000	+ 79·7
Net profits . .	7,255,000	2,654,000	+ 4,601,000	+ 173·3

Of course, such a result is not within the range of possibility in this country. But it should be clearly understood that this is what has been accomplished in the United States. That American lines have given the greater portion of the benefits arising from their economical working to the manufacturer and the trader, by reducing rates, does not alter the facts. The American lines are now reaping the benefit of

their great economies in the carriage of goods and passengers by the activity in the trade and prosperity of their country. We cannot, of course, anticipate that the railways of England will reduce the cost of carriage to the extent of the reduction in the United States, but we can and do expect them to do much better than they have in the past. When everything has been said as to the less density of traffic, the shorter haul of the English compared with the American lines—34·8 miles of the North-Western against the 110·1 of the Pennsylvania—and as to the larger quantity of small consignments in proportion to the total traffic handled by English compared with American lines, there can be no doubt that our lines are woefully behind. All the considerations that can be thought of, and which should be made for our English lines, cannot justify a train load of only 68 tons against the Pennsylvania's 484 tons. Everyone who gives careful consideration to the subject will admit that with the expenditure of a relatively small amount of capital upon reducing gradients and upon increasing the size of our toy trucks, and by the exercise of reasonable care in the loading of trucks and trains, an enormous improvement can be effected. We are sure that colliery owners and traders will, so far as lies in their power, assist the railways in reducing the cost of transport, for in doing so they will eventually add materially to their own profits; and

we are confident that railway shareholders will vote, with the greatest possible readiness, any money required to effect the necessary improvements. It remains, therefore, with the directors, chairmen and general managers to take the necessary measures. That railway managers have at length begun seriously to consider the matter, and to make experiments in handling heavier goods trains, we shall show in subsequent chapters.

CHAPTER IV

THE ALLOCATION OF EXPENDITURE BETWEEN
PASSENGER AND FREIGHT TRAFFIC

As our railways do not separate the expenses connected with their passenger traffic from the expenditure upon their goods traffic, it is necessary for us to explain the basis we have adopted in allocating the expenditure to the two—indeed, we may say, to the three—sections, if we include parcels, mails, &c.

In the case of *Smith and Forrest v. The London and North-Western Railway and Others* a great deal of discussion occurred, and evidence was furnished upon the relative cost of moving goods and passenger traffic; and the goods manager of the London and North-Western Railway explained that most of the companies concerned had adopted the plan of dividing the aggregate expenses in proportion to the receipts from the respective classes of traffic where no data were otherwise available. The separate data consist merely of the outlays upon repairs and renewals of carriages and waggons, of compensation

for passengers and goods, and of Government duty upon passengers. This method of allocation of the expenses between passengers, parcels, &c., and goods is extremely crude, and would be most misleading were the goods train loads of the companies very much heavier than they are. Under existing conditions of working, and in the absence of separate accounts, no other method of allocation can be adopted, and consequently we have been compelled to follow the plan considered by the railways themselves to be fairly accurate. We trust, however, our railways will now consider the question of keeping separate accounts for their passenger, merchandise, and mineral expenses.

We should point out that we have excluded rates and taxes and Government duty from the cost of moving traffic in this country, as well as in the United States, as railway managers are not responsible for the growth in rates and taxes, and certainly cannot be held accountable for the absurd Government duty on first and second class passengers.

That railway managers may check our calculations as to the relative cost of moving goods and passengers in this country, we set out below the North-Western's gross earnings from and expenses of passengers, parcels, and mails, freight and total traffic. Rents received and taxes paid are set out separately, as we

have excluded them from our calculations of the earnings from and expenses of passengers and freight. The figures for 1880 are :—

Gross Earnings, Expenses, and Net Earnings of the London and North-Western Railway for 1880

	Gross earnings	Expenses	Ratio to gross earnings	Net earnings
	£	£	%	£
Passengers . . .	3,056,000	1,517,000	49·63	1,643,000
Parcels	647,000	321,000	49·63	349,000
Total passengers	3,703,000	1,838,000	49·63	1,992,000
Freight	5,921,000	2,758,000	46·56	3,036,000
Railway earnings and expenses .	9,624,000	4,596,000	47·75	5,028,000
Rents, taxes, &c. .	141,000 ¹	337,000 ²	—	Dr. 196,000
Total	9,765,000	4,933,000	50·51	4,832,000
No. of passenger miles	760,760,000	—	—	—
Ton miles	1,194,078,000	—	—	—
Per passenger per mile	d. ·965	d. ·478	49·63	d. ·487
Per ton per mile	1·190	·554	46·56	·636

¹ Rents.

² Taxes and Government duty.

On the next page we set out our calculations, on the same basis, of the expenditure incurred in 1900 in handling the various classes of traffic.

The figures for 1900 are :—

Gross Earnings, Expenses, and Net Earnings of the London and North-Western Railway for 1900

—	Gross earnings	Expenses	Ratio to gross earnings	Net earnings
	£	£	%	£
Passengers . . .	4,768,000	2,921,000	61·27	1,849,000
Parcels	1,225,000	751,000	61·27	472,000
Total passengers .	5,993,000	3,672,000	61·27	2,321,000
Goods	7,632,000	4,427,000	58·00	3,205,000
Railway earnings and expenses .	13,625,000	8,099,000	59·44	5,526,000
Rents, taxes, &c. (net)	258,000 ¹	476,000 ²	—	Dr. 218,000
Total	13,883,000	8,575,000	61·76	5,308,000
No. of passengers carried one mile.	1,316,289,000	—	—	—
Tons carried one mile	1,549,556,000	—	—	—
Per passenger per mile	d. .869	d. .533	61·07	d. .336
Per ton per mile	1·189	·686	58·00	·503

¹ Rents.

² Taxes and Government duty.

CHAPTER V

COMMENTS OF LORD STALBRIDGE, THE CHAIRMAN OF THE
LONDON AND NORTH-WESTERN, ON THE FOREGOING
COMPARISONS

A LARGE number of the more important railway officials of the country attended the annual dinner of the Railway Benevolent Institution at the Hôtel Cecil on May 11, 1901. The Right Hon. Gerald Balfour, M.P., President of the Board of Trade, was in the chair. In responding to the toast of 'The Railways of the Country,' proposed by Lord Hillingdon, Lord Stalbridge, Chairman of the London and North-Western Railway, said that after the kind way in which the proposer of the toast had spoken of railways one really felt there was some hope for them, yet when one saw what was said about them in the public prints generally one would think they were the curse of this country, instead of their being, as they really were, the blessing of the country. The prosperity of the country is largely bound up with the prosperity of the railways, and he was perfectly certain that as long as competition existed among railway companies the public might be certain the service would be the best that could possibly be afforded. A great many

comparisons had been drawn lately, and very ably drawn, in articles that had appeared in *The Statist*, between English and American railways, and he was bound to admit that a great deal of what was said was perfectly true. But it was impossible to carry the same load in goods trains in this country as was carried in America, because the conditions were absolutely different. All the efforts of the directors and officers of the railway companies had lately been directed to the one particular point of carrying the greatest possible load in the fewest possible trains. He had no doubt whatever that the country had entered upon a cycle of what was called bad trade. There had been a boom in trade during recent years, and they had been enjoying a prosperous time; but it was as certain as the sun sets that there would be a cycle of bad years, and, looking at that fact, it was the duty of everyone to see what could be done to effect the greatest economies possible in the working of the lines. They were prevented by Parliament from making profit in any other way than by economising. When trade was good they could not raise their fares or tolls, because they were prevented from doing so by Act of Parliament; and when trade was bad they had to keep to the same fares and tolls. Not having the elasticity of other commercial bodies, railway companies were obliged to do the best they could for themselves, but, at the same time,

they always had an eye to what they knew was best for the trade of the country, for the fostering of the trade of the country was the one way in which they could increase their profits. Many gentlemen present were fully aware of what had been done in America for some time past with regard to carrying heavy loads, and some of the Midland gentlemen would know what American engines can do in this country. There were none of those on the North-Western line, so he had not the advantage of making such a comparison. At the same time, the system of traffic in this country was so different from what it was anywhere else that it was impossible to economise in train loads to the same extent as was done in America. In this country a merchant in Manchester, Liverpool, Leeds, York, or any other of the big towns, feels that he must receive in the morning the invoice of goods awaiting delivery that left London only the night before, whereas in France and the rest of the Continent they have never less than three days allowed for delivery, and at some distances five, six, or seven days. If goods could be kept that length of time in this country, so that full train loads could be made up and despatched at convenient times, the goods traffic could be conducted more cheaply, but it would be impossible for railway companies to reduce rates if they had to deliver with the expedition prevailing at the present time.

CHAPTER VI

THE REPLY TO LORD STALBRIDGE


LORD STALBRIDGE'S attitude towards the question of the more economical working of our railways raises hopes that a very great improvement will ultimately be effected ; that no serious delay will occur in loading both trains and trucks more heavily ; and that as a consequence of the saving in train and car mileage working expenditure will be greatly reduced. Should these hopes be realised, it will mean that the profits of our railways will be enhanced, and that concessions in rates will be made to enable our traders to compete more successfully in foreign markets, and our farmers to supply larger quantities of food products to the home markets. Before passing to the more important matter contained in Lord Stalbridge's speech on May 11, 1901, we would first correct what appears to be a slight misconception of our criticism of English railway working. Lord Stalbridge is reported to have said : ' A great many comparisons had been drawn lately, and very ably drawn, in articles that had appeared in *The Statist*, between

English and American railways, and he was bound to admit that a great deal of what was said was perfectly true. But it was impossible to carry the same load in goods trains in this country as was carried in America, because the conditions were absolutely different. All the efforts of the directors and officers of the railway companies had lately been directed to the one particular point of carrying the greatest possible load in the fewest possible trains.'


We would point out that we expressly stated that our railways could not be expected to move as great train loads as the Pennsylvania. In our issue of May 4, 1901, we said: 'To what extent the train loads of this country can be increased is difficult to determine. To expect railways to increase their train loads to the level of the Pennsylvania's 480 tons is not reasonable, but that they can make a very great addition to an average train load of 68 tons is beyond doubt.' What we desire to make clear is, that during the past twenty years our railways have failed to increase their train loads, either of passengers or of goods; that in consequence of the rise in wages the relative cost to our railways of carrying a ton of goods or a passenger one mile has greatly increased; that American railroads, by enormously adding to their train loads, have effected a very great reduction in the cost of moving traffic; and that in view of the failure of our railways to effect any economy in

the relative cost of working, notwithstanding the great growth of traffic of the past, the economies which should and can now be made are very great. It is, indeed, not unreasonable to expect, if the matter of heavier train loads is carefully considered and energetically proceeded with, that our railways will in a short period be able to double the loads now moved, and that ultimately a much greater improvement in the train load should be effected. We may point out that were the average train load of the North-Western to be raised from 68 to 136 tons—that is, doubled—the larger load would still be less than one-third of the average load of the Pennsylvania.

[But the more important matter of the speech is contained in the following quotation, which we commend to the serious attention of traders and others. Lord Stalbridge said : ‘ The system of traffic in this country is so different from what it is anywhere else that it is impossible to economise in train loads to the extent that is done in America. In this country a merchant in Manchester, Liverpool, Leeds, York, or any other of the big towns, feels that he must receive in the morning the invoice of goods awaiting delivery that left London only the night before ; whereas in France and the rest of the Continent they have never less than three days allowed for delivery, and at some distances five, six, or seven days. If goods could be

kept that length of time in this country, so that full train loads could be made up and despatched at convenient times, the goods traffic could be conducted more cheaply, but it would be impossible for railway companies to reduce rates if they had to deliver with the expedition prevailing at the present time.' 

From this it will be noted that the attitude of railway managers to heavy loading, economies and lower rates is twofold. Firstly, they are endeavouring to load more heavily under the existing system of what we may term express delivery for all goods. Secondly, the railway companies declare that if their train loads are to be increased to an extent to enable them to make concessions in rates to traders, the latter will have to give them a longer time in which to transport the goods from one point to another. As this is the attitude of the railway companies, and as there is no doubt that traders will gladly give the railways the longer time needed to enable them to carry heavy train loads, there is apparently no serious obstacle to the accomplishment of the end in view.

Unquestionably, the railways can very considerably reduce the goods train mileage, without affecting the rapidity of delivery, merely by increasing the length of their existing trains. The only obstacles to making trains much longer are, first, the length of 'refuge' sidings, and, secondly, the 

controlling of heavily loaded trains upon steep gradients. But these difficulties are not serious. The 'refuge' sidings would take longer trains than are now moved, and, even should some addition to the length of these sidings be required, the cost would be relatively small in view of the advantages to accrue. And as regards the difficulty of controlling heavy trains upon inclines, a considerable increase could be made to the existing train loads without the least danger.

When the railways have increased their train loads to the point beyond which they cannot go without holding back goods to secure enormous loads, there is no doubt that traders will give every assistance to the railways if they are offered some concession in rates for slow delivery. We are quite within the mark when we state that the urgent delivery of three-fourths of the goods carried by our railways is not necessary, and that the question of whether or not the goods are a day, or even two days, longer on the road than they are at present would be regarded by traders as a small matter compared with the concession in the freight rate which would be possible. Of course prompt delivery is essential as regards a certain proportion of the goods carried by our railways; but there is no urgency for coal, coke, iron ore, iron pipes, iron girders, other iron ware, bricks, pottery, raw wool, raw cotton, wheat, and

many other articles. Indeed, experience has shown to the railways that wherever a more economical means of transport than railway carriage is available, these articles are sent by the cheaper route. The longer time required to carry goods by water is considered no drawback compared with the saving in money from the lower rates. Consequently, were the railways to make some concession in rates to traders who are willing to have their goods carried by the slow method in heavily loaded freight trains instead of by express freight trains at express freight train rates, there can be little doubt that the bulk of the goods would be sent by the slow method, and that, so far as the trader is concerned, the railways would have no difficulty whatever in securing as great train loads as they can build engines to move or can create brake-power to stop.

But while the railways can greatly increase their train loads under their present system of working, and can further indefinitely increase them so far as the consent of traders to slower delivery is concerned, there are, of course, other minor difficulties to be overcome before very heavy loads are practicable. That the railways can at once materially increase their train loads by adding to the length of their trains is undoubted. But the extent of this increase is limited, and the introduction of longer trains will soon necessitate the introduction of larger cars, in

E

order to reduce the dead weight, and to enable the trains to be easily handled. In securing larger cars some difficulty will probably be experienced by reason of the very large number of waggons which do not belong to the railways, but which are the property of private owners. The total number of waggons in the country is about 1,300,000, of which nearly 700,000 are owned by the railways and about 600,000 by private owners. Thus the railways have control of only about 54 per cent. or 55 per cent. of the total; and it is apprehended that the process of inducing private owners to increase the size of their waggons and to load them more heavily will be a serious obstacle in the way of heavy train loads. Although the importance of this difficulty must not be underestimated, it does not seem to be insuperable. The economy, for instance, in moving 20 or 30 tons of coal per truck, as against the existing average truck loads of about $7\frac{1}{2}$ tons of coal, would be so great that the large coal merchants and colliery owners would be obliged to build larger trucks in order to obtain the advantage from the reduction in rates which the railways could make by moving coal in the greater car loads. Coal can be moved in the United States so cheaply that a rate of .075 of a penny per ton per mile has been found adequate upon one railway to cover the cost of handling, and on others coal is handled at a cost of less than

one-tenth of a penny per ton per mile. It would, of course, be quite impossible for coal to be moved so cheaply were it not for the very heavy train loads, and the fact that the coal is carried in 40 and 50 ton trucks. Larger cars will of course necessitate the reconstruction of weighing-machines and turntables and other alterations; but capital outlays by colliery owners and others for these purposes would be extremely profitable, and would ultimately be offset by the reduced capital required for the construction and sums needed for the maintenance of the larger cars, as compared with the sums needed for the building and maintenance of a larger number of small capacity cars.

Thus the position is that the railways are striving to move larger train loads; that if the traders of the country will assist them they will ultimately be able to run very heavy loads and to make concessions in rates; and that as there can be no doubt that traders will gladly support the lines in their efforts to work more cheaply and to reduce rates, very great improvements in the economical working of our railways should be effected in the course of a few years.

CHAPTER VII

MORE INFORMATION NEEDED

IF our railways are to be worked more scientifically and economically they must devote a much greater amount of attention to the compilation of data upon which the general managers, the directors, and the chairmen can decide as to whether or not their roads are well administered. At present¹ the managers of a railway have no such detailed data, and can form merely haphazard opinions upon the services performed by their subordinates. They cannot really test the efficiency of their officers who have the practical working of the lines. The train mileage figures now laid before the general manager, and passed on by him to the chairman, the directors, and to the shareholders, are no real indication of efficient working. What the general manager requires in order to exercise effectual control is the following information:—

1. Ton mileage. (a)
2. Passenger mileage. (b)

¹ This article appeared in *The Statist* of March 16, 1901.

(a) Separating (1) merchandise and live stock and (2) minerals.

(b) Of each class of passengers separately.

3. Train mileage. (*c*)
4. Train loads. (*d*)
5. Waggon mileage. (*a*)
6. Waggon loads. (*a*)
7. Carriage mileage. (*b*)
8. Carriage loads. (*b*)
9. Engine mileage. (*d*)
10. Engine loads. (*d*)
11. Tonnage. (*e*)
12. Number of passengers. (*b*)
13. Average length of haul. (*d*)
14. Number of waggons per train. (*a*)
15. Number of carriages per train. (*b*)
16. Average rates per ton per mile. (*a*)
17. Average receipts per passenger per mile. (*b*)
18. Average receipts per train mile. (*d*)
19. Expenses per ton of merchandise, per ton of minerals, and per passenger per mile.
20. Expenses per merchandise, mineral, and passenger train mile.

(*a*) Separating (1) merchandise and live stock and (2) minerals.

(*b*) Of each class of passengers separately.

(*c*) Of (1) merchandise and live stock trains, (2) mineral, (3) mixed merchandise and mineral, (4) passenger trains.

(*d*) Of (1) merchandise and live stock, (2) mineral, (3) passengers.

(*e*) Divided into (1) merchandise and (2) minerals. Further, a detailed description of the traffic should be secured for the purpose of ascertaining the relative proportions of high and low class, bulky and compact freight, and whether or not the traffic should be handled in large or small waggons.

All this information should be supplied to the general manager—and by him passed on to the chairman and directors—by the accounting department in sufficient detail that he can immediately ascertain on which portions of the system the greatest ability is displayed in handling the traffic economically. Thus he would be in a position to compliment or censure district superintendents, who should be held directly responsible for the economical handling of the traffic in their various districts.

Before proceeding further it would, perhaps, be well to explain the meaning and significance of the various terms and information desired. Probably this may be unnecessary to the reader who has followed the fortunes of Indian, Canadian, American, Mexican, and other foreign railways, but there may be, and probably are, others who are not acquainted with the significance of *ton mileage*, for instance, which is the most important information required for determining under what condition a railway works, both as to the average rates obtained and the economy exercised in handling the traffic, but as to which no information is now possessed by our railway managers.¹

(1) TON MILEAGE is literally *weight* multiplied by *distance*, and is the common denominator to which

¹ The North-Eastern has now decided to compile the information (see Chapter XXI.).

weight and distance can be reduced. Thus, 10 tons carried 10 miles are equal to 100 tons carried one mile, and the ton mileage is consequently 100. Again, if 100 tons are carried 30 miles the ton mileage is 3,000, that being the equivalent number of tons carried one mile.

(2) PASSENGER MILEAGE is arrived at in a similar manner. Ten passengers travelling 10 miles are equal to 100 passengers travelling one mile.

(3) TRAIN, WAGGON, CARRIAGE, AND ENGINE MILEAGE need no explanation. These particulars are now compiled.

(4) The TRAIN LOAD OF GOODS is obtained by dividing the train mileage into the ton mileage. Thus, if the ton mileage is 1,000,000 and the train mileage 10,000, it follows that the average train load is 100 tons.

(5) The TRAIN LOAD OF PASSENGERS is similarly arrived at, the passenger mileage being divided by the train mileage.

(6) The WAGGON LOAD is obtained by dividing the car mileage into the ton mileage. Thus, if the ton mileage is 1,000,000 and the car mileage 200,000, it follows that the average car load is 5 tons.

(8) The CARRIAGE LOAD is similarly arrived at, by dividing the carriage mileage into the passenger mileage.

(10) The ENGINE LOADS are obtained by dividing

the freight and passenger engine mileage into the ton and passenger mileage.

(13) The AVERAGE LENGTHS of haul for goods and passengers are obtained by dividing the tonnage and the number of passengers into the ton and passenger mileage.

(14) The NUMBER OF WAGGONS per train is obtained by dividing the freight train mileage into the waggon mileage.

(15) The NUMBER OF PASSENGER COACHES per train is reached by dividing the passenger train mileage into the carriage mileage.

(16) The AVERAGE RATE PER TON PER MILE is secured by dividing the ton mileage into the freight receipts. Thus, if the ton mileage be 1,000,000 and the receipts be 41,666*l.*, the average rate per ton per mile would be 1*d.*

(17) The AVERAGE RECEIPTS per passenger per mile is secured by dividing the passenger mileage into the receipts.

Now what is the value of this information, so essential to the economical management of our railways? It is this. First, the general manager will be able to ascertain the capacity of his subordinates; secondly, if the information is published, as we trust it will be, in the interest both of the railways and of the country, the chairmen, directors, the shareholders, and the public will be able to determine whether or

not the railways are well administered ; and, by comparison, which railway manager gets the best results.

The great value of the information we ask for has already been tested in the United States and elsewhere, and has proved an enormous power in bringing about the utmost economy in administration and the working of the lines on the most scientific principles. The possibilities of economy in running very heavy train loads were first recognised by Mr. James J. Hill, the President of the Great Northern Railway of America. This gentleman, by dividing his system into sections and obtaining the detailed information—which we urge our own railways should now compile—as to each division, was able closely to supervise the practical operation of the whole system. Moreover, his district superintendents were thus brought into competition one with the other, and each endeavoured to save train mileage by loading the trains under their charge more and more fully. And at the present time the Great Northern of the United States is one of the most economically and scientifically administered railways in the world as well as one of the most profitable. Mr. Hill's success and the figures he published of train loads—which can be obtained only by the compilation of the ton mileage—of course stimulated other American railways to follow his example, and at the present time the whole of the railways of the

United States are working on the same principle. Year by year they are carrying larger train loads, and proportionately reducing their train mileage and their cost of working. To show the effect of increasing the train load we may take the figures of the New York Central, one of the largest and best administered systems in the United States. In 1896-7 this Company ran 14,000,000 freight train miles, carrying 23,020,000 tons of freight, for an average of 177 miles. Its ton mileage was consequently 4,070,130,000, and its average train load was 290 tons. In 1900-1 the Company ran 16,400,000 train miles to carry 43,939,000 tons, for an average distance of 154 miles. Its ton mileage consequently reached 6,770,752,000, and its average train load was 411 tons. Thus an increase of 66·3 per cent. in the ton mileage, *i.e.* the work performed, was attended by an increase of 41·7 per cent. in the train load, and an increase of only 17 per cent. in the train mileage. Further, the Company greatly reduced its car mileage in proportion to the work done. The addition of 41·7 per cent. to the train loads has been secured by adding no less than 30 per cent. to the weight of the freight in each waggon, the addition to the number of waggons in each train having been only 10 per cent. To show the value and use of the additional information we now suggest our railways should compile, we

contrast below the working results of the New York Central in 1900-1 and in 1896-7 :—

—	1900-1	1896-7	Increase or Decrease	
				%
Ton mileage ¹	6,770,752,000	4,070,130,000	+ 2,700,622,000	+ 66·3
Train mileage, freight .	16,200,000	13,762,000	+ 2,438,000	+ 17·7
Train mileage, mixed .	353,000	377,000	— 24,000	— 6·3
Train load, tons ¹ .	411	290	+ 121	+ 41·7
Car mileage .	590,569,000	463,122,000	+ 127,447,000	+ 27·5
Waggon loads, tons . .	11·45	8·79	+ 2·66	+ 30·2
Engine mile- age . .	22,575,000	—	—	—
Engine load, tons . .	300	—	—	—
Tonnage ¹ .	43,939,000	23,020,000	+ 20,919,000	+ 90·9
Average length of haul, miles	154	177	— 23	— 13·0
No. of cars per train . .	36	33	+ 3	+ 9·9
Average rate per ton per mile . .	Cents 0·58	Cents 0·68	— Cents 0·10	— 14·7
Average re- ceipts per train mile .	\$2·11	\$1·84	+ \$0·27	+ 14·6

¹ Including Company's freight.

Although there has been no desire on the part of the New York Central to restrict its facilities for passenger traffic, it has been careful not to increase the mileage of its passenger trains in as great a proportion as the growth in its passenger traffic. It consequently secured a somewhat larger load of

passengers per train and per car in 1900-1 than in 1896-7. The utility of the additional information as to passenger traffic which our railways should possess will be appreciated from the following contrast of the passenger trains and carriage results of the New York Central in 1900-1 and in 1896-7 :—

—	1900-1	1896-7	Increase or Decrease	
Passenger mileage .	915,925,000	689,764,000	+ 226,161,000	+ 32·9
Train miles, passengers . . .	17,340,000	14,664,000	+ 2,676,000	+ 18·2
Train miles, mixed .	353,000	377,000	— 24,000	— 6·3
Number of passengers per train .	53	47	+ 6	+ 12·8
Carriage mileage . .	95,759,000	73,320,000	+ 22,439,000	+ 30·6
Number of passengers per carriage .	9·5	9·4	— 0·1	— 1·0
Passenger engine mileage . .	18,260,000	—	—	—
Number of passengers per engine .	50	—	—	—
Number of passengers . . .	30,319,000	23,166,000	+ 7,153,000	+ 30·8
Average length of haul per passenger, miles . .	30	30	—	—
Number of passengers per train .	5·5	5·0	+ ·5	+ 10·0
Average receipts per passenger per mile . . .	Cents 1·83	Cents 1·90	— Cents 0·07	— 3·7
Average receipts per train mile . .	\$1·14	\$1·08	+ \$0·06	+ 5·5

The enormous benefits which result from reduced train and car mileage are these :—There is

a great reduction in the dead weight which each engine has to pull; an immense saving in fuel; an important saving in wages—not a lower scale of wages—for engine drivers, stokers and guards, as fewer are needed in proportion to the traffic; proportionate savings in maintenance and renewals; a less congested traffic, with all the advantages which attend upon a smaller number of trains upon a limited number of lines.

Now what has been the effect of this reduction of train mileage and increase in train load upon the expenses of the New York Central Railroad? This Company's expenses for transportation, which include all charges incidental to moving the traffic, but nothing for maintenance of way and equipment or management, in 1896-7 were \$17,215,000. In 1900-1 they were still only \$21,410,000, an increase of \$4,195,000. Thus with a growth of 66·3 per cent. in the number of tons carried one mile, and of 32·9 per cent. in the passengers carried one mile, the cost of transportation increased only 24·4 per cent. Had there been no increased loading of trains and cars the transportation expenses of the Company would have increased nearly \$9,000,000, or over 50 per cent., instead of only \$4,000,000. Thus the Company has benefited from a growth in profits on the one hand, and the public from a reduction in rates on the other, to the extent of \$5,000,000 per annum. In

other words, the increased loading of both freight and passenger trains has meant a relative saving of 20 per cent. in the cost of transportation, and the heavier loading of freight trains alone has resulted in a reduction of nearly 30 per cent. in the cost of transporting a ton of freight one mile. What would be the profits of our railways if in four years they could reduce the cost of handling their combined passenger and goods traffic by 20 per cent., or could reduce the cost of handling their goods traffic by 30 per cent., without effecting any economies in the passenger traffic?

The great savings which might be effected by our railways were they to increase their train loads will be apparent from the following statement of what has been done by the New York Central in the past four years :—

—	1900-1	1896-97	Increase	
Ton mileage .	6,770,752,000	4,070,130,000	2,700,622,000	% 66·3
Freight train load	411	290	121	41·7
Passenger mileage	915,925,000	689,764,000	226,161,000	32·9
Passenger train load	53	47	6	12·8
Cost of conducting transportation .	\$21,410,000	\$17,215,000	\$4,195,000	24·4

In the preceding chapters we showed approximately what the present train loads of our railways

are, and gave some indication of what might be the saving and effect upon profits were they materially to increase them. But the first essential to success is the compilation of the information we suggest. Of course, the information cannot be collected as regards the past, but the companies should now make preparation for the compilation of the figures in the future.

By the courtesy of the Pennsylvania Railroad we have been supplied with an account of, together with a complete set of the sheets used by that great Company in the compilation of, its ton mileage, average rate per ton per mile, and other information, and we shall be happy to lend the sheets to any of our general managers who desire to study the system so successfully adopted by their American *confrères*.

CHAPTER VIII

RAILWAY STOCKHOLDERS' ASSOCIATION SUGGESTED
BY A SHAREHOLDER

THE following important letter from a holder of British railway stock, in which the writer gave expression to the alarm of shareholders at the continuous decline in their dividends, and urged that stockholders should combine to protect their interests, appeared in *The Statist* of July 13, 1901 :—

To the Editor of 'The Statist'

'SIR,—After the prominence you have recently given in your columns to the subject of British railway working, I hope you will allow me to supplement the letter of mine you kindly inserted on May 25 by the addition of one or two observations and a suggestion. There is abundant evidence that shareholders are becoming uneasy, not to say alarmed, at their prospects, but in vain do they look for any sign that railway directors and managers are taking any important action to check the continuous decline

in dividends. No doubt we are expecting, and shall be grateful for, the relief that will be afforded by the substantial fall in the price of coal; but while this may materially help to increase our dividends for the coming year it will only bring a temporary improvement unless there is a radical change in the working of English railways.

‘So many letters and articles have appeared in various newspapers condemning the large capital expenditure that is taking place, and the unnecessary train mileage that is being run, that I am almost ashamed to revert to these two main causes of our gloomy outlook; but unless these can be seriously grappled with we need not expect any permanent upward movement in railway dividends. Therefore, while there are many other smaller reforms and economies that ought to be introduced, I will confine myself to asking—How is this capital expenditure to be minimised and the train mileage reduced? Such is the want of harmony amongst competing railways, I do not think anything material can be done in these directions unless some pressure by shareholders is brought to bear on the various boards. Could there be a stronger proof of this than the suicidal racing of trains to Scotland that has just been commenced by the Midland Company, which can only end in one way—the traffic by the three great routes will continue much in the same proportions as at present,

F

but each Company will have wasted a large sum of their shareholders' money.

'Can nothing be done by these suffering shareholders to protect their interests by bringing about a wiser and better feeling between competing companies? An association for this purpose need not be antagonistic to our various boards; but it might be the means of introducing many economies which would help to stop our falling dividends, without any loss of accommodation to the public. I believe there are thousands who would be ready and willing to join such an association; but, in the first instance, it would require some shareholders of influence to take the initiative, and though the distance I live from London and my age would prevent my taking a foremost part in forming this association, I am quite willing to lend a helping hand, and to receive the names of any shareholders who are willing to co-operate.—Yours, &c.

'RICHD. GREEN.

'The Whittern, Kington, Herefordshire :

July 9, 1901.'

CHAPTER IX

APPROVAL OF THE SUGGESTED RAILWAY SHAREHOLDERS'
ASSOCIATION¹

EVERYONE must admit that English railway stockholders are in a most unpleasant position, and most people recognise that the prospect of any permanent amelioration of their unhappy state in a large measure rests with their own efforts to bring about reform. Railway reform has indeed become an imperative necessity both to the shareholder and to the community. The antiquated methods of working; the excessive and oftentimes foolish competition between the Companies, involving loss to all concerned; the onerous burdens imposed by Parliament; and the excessive rates imposed by the local authorities upon the one industry which can do more to restore prosperity than any other to the rural districts, all call for serious consideration and reform. It is idle to ask who is responsible for the present deplorable state of affairs—for the inefficient, costly, and unremunerative railway service. All are re-

¹ This article appeared in the *Statist* of July 13, 1901.

sponsible in varying degrees—the managers, the directors, Parliament, the public, and the shareholders. But the question has now to be faced. How can a new order of things be brought about? How can economies be effected, a better service afforded, rates be reduced, and dividends increased? We have endeavoured to answer these questions. We have pointed out that our railways run an enormous amount of unnecessary train mileage, both in the transport of goods and of passengers; that if our railway companies will now follow the example of the great railways of America, and will devote much greater attention to loading their cars and their trains more heavily, they will be able to bring about a very great reduction in train mileage; and that they will be able to effect very great economies. The value of the American example is, we are glad to find, widely admitted by railway directors and managers, and a beginning is being made in the direction we have indicated. But, so far as we can judge, the movement towards improved conditions will be very slow, and the effects of the economies will be very small unless further steps are taken to bring the matter to the attention of those responsible for the administration of our railways, and unless shareholders render assistance to the railway companies which are desirous of bringing about the desired reforms. An association of railway shareholders, under an in-

fluent chairman and an efficient committee, would be an immense power for good in bringing pressure to bear upon the Companies who refuse to move, and whose adhesion to new methods of working are essential to the success of the reform movement. Our correspondent has referred to the existing race to the North as an instance of the want of harmony among the lines, and the waste involved by excessive competition; this race is merely typical of the waste in every direction resulting from the excessive competition to secure both passengers and goods heedless of cost.

But the scope for shareholders' activities and assistance is much wider than inducing directors and managers to adopt new methods of working. Municipalities, limited liability companies, and private owners require to be convinced of the advantages which would accrue to them and to trade from the provision of facilities for handling larger trucks at docks, at collieries, at iron furnaces and mills, and at other large works. Owners of waggons have to be convinced of the much greater economy in building, maintaining, and renewing trucks of large capacity as compared with the proportionate cost connected with smaller vehicles, of the greatly reduced proportionate cost of handling large bogie trucks, and of the probability that at no distant date railway companies will be in a position to offer concessions

to private traders who send goods in large truck loads. Of course, shareholders must first of all secure the repeal of that now absurd railway regulation respecting traders' waggons which prevents them from building trucks with a capacity greater than 10 tons.¹ In this matter they will probably have no difficulty. The Caledonian and the Furness have ordered mineral trucks up to 30 tons capacity, and others are preparing to follow suit.² Consequently, the railways are not likely to maintain their objection to the private trader constructing waggons of more than 10 tons capacity.

And there are still other fields in which the influence of the shareholder should be exerted. They should make themselves felt in Parliament, in the County and District Councils, and in the discussions of other rating authorities. Parliament and the rating authorities have long since lost touch with those first principles of taxation which impose as light and not as heavy burdens as possible on the cost of production. It is essential that railway shareholders whose interests are directly affected, should protest against and endeavour to find some means of removing the onerous burdens placed upon the railways

¹ The railway companies are now drawing up new Clearing House specifications for larger 'traders' waggons.' See page 146.

² The Lancashire and Yorkshire Railway has now built some 30-ton merchandise waggons and the North-Eastern has ordered a quantity of 32-ton and 40-ton mineral waggons.' See pages 232 and 276.

tending to increase the cost of production of every commodity. No one, we think, will deny that one of the most important reasons for the non-profitableness of farming in this country is the low cost of transporting grain and other products for thousands of miles over the railways of the United States, and the high rates charged by our own railways for the carriage of traffic of every kind. How will it be possible for our railways to reduce rates if Parliament continues to burden them with conditions and restrictions which enormously increase the cost both of construction and of working?

The right policy for the imperial and local authorities to pursue is to relieve the cost of transport of every burden possible, and to aim at securing for the whole community the enormous benefits which would result from lower rates for both freight and passengers.

The cost of widening lines and providing the facilities for handling the traffic in our great towns is enormous. Not only has land to be bought at excessively high prices, but the railway companies are compelled to re-erect labourers' dwellings in an expensive style at a cost which cannot be covered from the rents which are permitted to be charged. That is to say, the rents received do not pay the interest on the money raised for erecting the buildings and for covering the recurring expenses. Surely it

is the height of unwisdom to increase the cost of transportation by compelling the railways to provide for the rehousing of the working classes. Nor is this the whole of the trouble. Parliament compels the railways to carry at a loss enormous numbers of workmen. Surely, if it is essential to the good of the community, as we believe it is, that our working classes should be rehoused when their dwellings are required to admit of new railways; and if it is for the good of the community that workmen should travel by railway beneath the cost of transit, then the community as a whole, and not the ordinary stockholders of our railways alone, should bear the expense involved by these obligations. Parliament may be assured that capital will not be provided for railway extensions, widenings, and improvements if the burdens imposed are too heavy to be borne. The non-construction of needed means of transportation would be a heavy penalty for the country to pay for any misconception as to who should bear the cost of rehousing the poor and of carrying them to suburban districts. Further, the action of Parliament in giving to the Board of Trade the practical power of fixing the hours of labour for railway servants is a matter which requires to be carefully considered. The time is coming when this country will have to exert all its energies and power of thought to keep abreast of the competition of the United States and of Germany,

and every section of the community may have to work harder than it has recently done. But it will be better to labour for long hours per day and be prosperous than to work for fewer hours daily and be in a condition of poverty. In recent years the hours of labour of railway servants have been greatly reduced, while their rate of pay has risen. This means one of three things: (1) railway rates must be increased, or (2) railway dividends must suffer, or (3) labour-saving plans and appliances must be more extensively adopted. The two first effects have hitherto resulted from the rise in wages and shorter hours. But the third should be the ultimate effect.

It will thus be evident that a powerful association of railway shareholders is a matter of importance to the future prosperity of our railways and of the country. Impoverished railways must mean dear and inefficient transportation. And defective and expensive means of transit, attended by fierce competition of foreign countries, will have a permanently adverse effect upon the well-being of the country. We trust, therefore, that the proprietors of our railways will appreciate their responsibilities, and will exert themselves to bring about the reforms which are essential to their own and to the country's prosperity.

CHAPTER X

MR. TOUCH ON THE SUGGESTED RAILWAY SHAREHOLDERS'
ASSOCIATION

To the Editor of 'The Statist'

SIR,—I read with interest Mr. Green's letter in your issue of the 13th ultimo advocating the formation of a British railway shareholders' association. Your admirable and convincing remarks in support of the suggestion have attracted wide attention, and I trust that some definite action may result. Speaking generally, I cannot see anything but good in the formation of an association for the protection of shareholders' interests, subject always to this important provision, that the executive of such an association shall consist of men of business instincts, habits, and experience. Unless this provision is strictly adhered to there is great danger that the proposed organisation would degenerate into an association of faddists, and of people who would occupy the time of railway authorities in academic discussions involving no practical results. If wisely directed,

the association should do much to promote the future prosperity of the railways and of trade. Amongst other things, it should help to bring the railway chairmen and general managers more into line, and to impress upon them the necessity of maintaining "spheres of interest," and of avoiding attacks on each other's territories. Witness the recent action of the Midland Company. It is common report that after the retirement of one general manager, and before the advent of his successor, that Company made a misguided bid for Scotch traffic, for which the position of their road is physically unadapted—a traffic, moreover, which they deliberately abandoned a few years ago as not being worth the expense attaching to it. This mistake might have been avoided by the intervention of an association such as Mr. Green suggests, one of whose objects would be to promote, and, if need be, bring authority to require, more harmonious and intimate relations between the boards of the various Companies and their officers. But, after all, the main difficulty of the situation rests with Parliament, who in a daily increasing degree are striving to put fresh obligations on the railway interests of the country. Take, for instance, the question of the housing of the working classes, a problem which should be approached both by Parliament and the railway companies in a reasonable and humane

spirit. The London and North-Western Railway Bill was thrown out on this issue; and why? We hear that the Railway Company purchased certain land for warehouse purposes. Under the contract the land was to be delivered to them free from all liabilities for rebuilding working-men's dwellings. Parliament at once steps in and says this is an evasion of the Act, and that the Company in acquiring the land must rehouse. Result—the Railway Company has to abandon the construction of the necessary warehouses and to resell the land, as it would be too costly to re-erect workmen's dwellings.

‘Again, a large railway company has to purchase land for terminals in London, thereby having to destroy sundry labourers’ dwellings. Parliament says to the Company, you must re-erect dwellings elsewhere. But under what conditions? And here comes the monstrous part of the arrangement. The Home Office insist on these dwellings being put up under their supervision, which means a probable addition of 50 per cent. in the cost (as they have no interest in studying economy), and further demand that they (the Home Office) shall have the fixing of the rents, the result of which is that the Company in question will be forced into an expenditure of some £300,000 to £400,000 without any return whatever. How, I ask, are railway interests to be properly administered when such a state of things is allowed

to prevail? And it is not only the railway interests that suffer (although upon them falls the chief burden); but it is injurious to the prosperity of many industries, and seriously hampers them in competition with foreign rivals, that the cost of transportation should be increased, or that necessary facilities for transportation should be lacking, because the Legislature seeks to impose on railway companies the whole obligation of housing the poor.

‘And here, sir, such an association as you contemplate would be of enormous value, if only for the purpose of showing to the ordinary shareholders (on whom these burdens press most heavily) how they are being daily shorn by the action of a shiftless Legislature, swayed by the outcry of professional agitators, and of demonstrating to the great body of shareholders in railway companies throughout the country how necessary it is for them to insist that their Parliamentary representatives shall not vote for any Bills which have for their object the manifest spoliation of a large and innocent portion of the community. When Parliament can once be made to understand that the public generally will not permit these gross injustices to one portion of the community, then the entire energies of railway chairmen and managers can be devoted (as they should be) to the economical and reasonable administration of their various concerns, and to grappling more



seriously with the many problems which you, sir, have so justly enumerated, instead of having to spend half their time in defending attacks upon their property—attacks which, in the long run, must react on the general interests of the country.

‘Again, the whole question of the “rating of railway companies” is grossly unjust. The Companies have done much to improve the value of the land in the particular districts where their property is situated, but assessments go up by leaps and bounds, and an enormous expense is put upon the railways at the hands of rating authorities, who do not seem to appreciate that they have any interest whatever in lightening the burdens upon the transportation business of the country. I have in my mind at the present moment the case of one parish in London which has raised its rate by 7*d.* in the £ during the present year, the bulk of this, of course, falling on one railway, which has no voice in the expenditure of the money in question. Take, again, the case of the trades unions, admirable in their inception, but now seeking to control the government of the railways, in which they have, of course, not one penny of pecuniary interest. The Amalgamated Society of Railway Servants consists of some 60,000 men, as against some 500,000 non-union men. Yet the Society, which consists of only some 10 per cent. of those employed, seeks through Parliament and by

pressure on individual (and, alas ! frequently ignorant) Members of Parliament, to dictate to the Companies not only whom they are or are not to employ, but the very hours of labour, and the remuneration of the same ; and all this is taking place at a time of the fiercest competition with America for trade, and when, unless we can devote all our energies to economical and efficient administration, we shall undoubtedly be beaten in the battle for the world's trade.

‘This brings me back to my original suggestion, that all railway shareholders should put continuous pressure on the Parliamentary representatives in their several localities especially, and throughout the country generally, to impede and resist all legislation in Parliament which has for its object the placing of further burdens on the railway companies, or the interference with their just privileges ; and that any shareholders’ association which may be formed should closely scrutinise the voting in the House of Commons to the detriment of the railway companies, with a view to a reckoning with those who, in their ignorance or recklessness, are so seriously prejudicing the best interests of the country, and especially of labour. In this question the true interests of capital and labour go hand in hand. If capital seriously takes alarm (and the enormous expenditure which it is called upon to make, coupled with shrinking returns,

are already causing much uneasiness), the discouragements to capital will react on labour, and there will be a lack of employment for the working classes throughout the country.

‘Yours faithfully,

‘GEORGE A. TOUCH.

‘Eaton Tower, Caterham Valley :

‘August 2, 1901.’

CHAPTER XI

GROWING TRAIN LOADS ¹

WERE there nothing more encouraging to say about the position and outlook of British railways than was said by many of the railway chairmen at the railway companies' autumn meetings, a gloomy view of their position would indeed be warranted. They point out that it is useless to compare English with American railways, as the conditions are so different. The one has short hauls, the other long; the one has cost enormous sums to build per mile, the other next to nothing, land having been given free in many instances; the one has unlimited time to deliver goods, the other has to deliver the next day. They state that want of harmony between our railways prevents them from saving unnecessary train and car mileage. They complain of the competition—which threatens to become more and more severe—of electric railways and tramways. They express indignation at the growing burdens imposed upon railways by Parliament and the local authorities. They state

¹ This article appeared in *The Statist* of August 24, 1901.

that capital expenditure must go on, thus indicating that capital charges must increase. And they express doubt as to whether or not gross earnings can expand for some time to come. The one bright spot in the position, according to most of the chairmen, is the fall in the price of coal and material. As regards material, however, some of the companies have placed orders forward at high prices, and these will derive no great advantage from the low prices until the contracts are completed. In most instances the chairmen are able to point with much satisfaction to a saving in train mileage in the past half-year, and have been able to compliment the officers upon their success in bringing about economies.

So far as the immediate outlook is concerned, railway chairmen have been quite justified in the attitude they have taken up. The position is gloomy. Earnings are falling and capital charges are increasing, and these conditions, combined with the growth of rates and taxes, and the burdens placed upon the railways by Parliament and by the Board of Trade, will go a long way towards neutralising the beneficial effects of the fall in prices of coal and material; indeed, they may in some cases prevent any improvement in profits and dividends for a time. But we believe that forces are now beginning to operate which will restore our railways to a condition of great prosperity, and which will enable them to give

a still more efficient and less costly service. In spite of what many chairmen have said about the futility of contrasting English with American methods of working, American methods have begun to be adopted. Moreover, our railway officials are extremely desirous of obtaining as much information about these methods as possible, and an unusual number of railway officials are now in, or are about to proceed to, the States to see for themselves how things are done there. That officers of British railways who visit the States will receive every assistance we do not doubt. The willingness of the Pennsylvania Railroad to place its ton mileage sheets at the disposal of our railways, the great courtesy with which railway officials from this side have always been received in the States, and the hearty invitations which we know have been given by American railway officials to their English *confrères*, are evidences that there is no lack of opportunity for those who desire to obtain hints and ideas as to new methods which may be adopted with advantage by our railways. As, on the one hand, there is a desire to obtain knowledge, and on the other there is great willingness to impart it, the result can be foreseen. Nor have we to wait for some company in the future boldly to proclaim that it has recognised the value of American methods, and that it is prepared to adopt some of them, at any rate. What could be more promising than this

statement by the chairman of the Lancashire and Yorkshire Railway, Sir George J. Armytage, Bart., at the recent meeting of that Company? He said, 'The satisfactory element in the accounts of the past half-year is the reduction in the goods train mileage which we have been able to effect by the increased loading of our goods and coal trains. We have adopted a system [the American system] under which such trains are made up to a tonnage basis equal to the haulage capacity of the engine, and not, as hitherto, upon a given number of waggons, which enables us to utilise our locomotive power to the fullest extent, and to reduce the number of trains running over the system, thereby not only effecting a saving in running expenses, but relieving the congestion which prevails at many points on the line. It is principally to this that we must look for future economies.'

And what the Lancashire and Yorkshire has begun to do other companies have also endeavoured to effect in a less systematic and consequently less efficient manner. To show what savings in train mileage the nineteen railways have effected in the June half of 1901, we set out in Table A the earnings, mileage, and earnings per mile of goods trains for the past half-year, in contrast with the first half of 1900; and we set out in Table B the earnings, mileage, and earnings per mile of passenger trains for the past half-year, in contrast with the first half of 1900.

TABLE A.—Goods Train Results

	Goods train earnings			Goods train mileage			Earnings per goods per mile		
	1901	1900	Inc. or Dec.	1901	1900	Inc. or Dec.	1901	1900	Inc. or Dec.
	£	£	£				d.	d.	d.
Furness	179,000	210,000	— 31,000	354,000	398,000	— 44,000	121·4	126·6	— 5·2
Great Central	939,000	1,047,000	— 54,000	4,672,000	4,960,000	— 288,000	50·9	50·6	+ 0·3
Great Eastern	1,064,000	1,076,000	— 12,000	4,130,000	4,287,000	— 157,000	61·7	60·2	+ 1·5
Great Northern	1,539,000	1,624,000	— 85,000	5,401,000	5,935,000	— 534,000	68·4	65·6	+ 2·8
Great Western	2,828,000	2,870,000	— 42,000	11,094,000	11,632,000	— 538,000	61·2	59·2	+ 2·0
Hull and Barnsley	148,000	174,000	— 26,000	552,000	679,000	— 127,000	64·3	61·4	+ 2·9
Lancs & Yorks	1,459,000	1,504,000	— 45,000	3,015,000	3,302,000	— 287,000	116·2	109·3	+ 6·8
London & Brighton	370,000	371,000	— 1,000	981,000	1,005,000	— 24,000	90·5	88·5	+ 2·0
London & N.-West	3,689,000	3,795,000	— 106,000	10,608,000	11,229,000	— 621,000	83·3	81·1	+ 2·2
London & S.-West	663,000	660,000	+ 3,000	2,357,000	2,394,000	— 37,000	67·4	66·0	+ 1·4
London Tilbury	51,000	50,000	+ 1,000	129,000	125,000	+ 4,000	94·8	96·0	— 1·2
Metropolitan	57,000	56,000	+ 1,000	80,000	94,000	— 14,000	171·0	143·0	+ 28·0
Metropolitan Dist.	2,000	2,000	—	3,000	3,000	—	159·8	159·8	—
Midland	3,611,000	3,784,000	— 173,000	13,153,000	13,667,000	— 514,000	65·8	66·4	— 0·6
North-Eastern	2,866,000	2,985,000	— 119,000	8,094,000	8,754,000	— 660,000	85·0	81·8	+ 3·2
North London	95,000	95,000	—	251,000	258,000	— 7,000	90·7	88·3	+ 2·4
North Stafford	273,000	279,000	— 6,000	583,000	578,000	+ 5,000	112·5	115·7	— 3·2
Sth.-Eastern & Chat.	519,000	516,000	+ 3,000	1,629,000	1,637,000	— 8,000	76·4	75·6	+ 0·8
Total	20,406,000	21,098,000	— 692,000	67,086,000	70,937,000	— 3,851,000	73·0	71·4	+ 1·6

TABLE B.—Passenger Train Results

	Passenger train earnings			Passenger train mileage			Earnings per pas. train mile		
	1900		Inc. or Dec.	1901		Inc. or Dec.	1900		Inc. or Dec.
	£	£	£				d.	d.	d.
Furness . . .	63,000	59,000	+	4,000	312,000	312,000	—	48·5	45·1
Great Central . .	419,000	382,000	+	37,000	4,282,000	4,238,000	+	23·5	21·6
Great Northern . .	1,109,000	1,102,000	+	7,000	5,697,000	5,764,000	—	46·7	45·9
Great Eastern . .	1,337,000	1,270,000	+	67,000	5,900,000	5,954,000	—	54·3	51·2
Great Western . .	2,424,000	2,316,000	+	108,000	11,230,000	11,128,000	+	51·8	49·9
Hull & Barnsley . .	13,000	14,000	—	1,000	207,000	220,000	—	15·1	15·3
Lanes & Yorks . .	1,070,000	1,061,000	+	9,000	5,872,000	5,864,000	+	43·7	43·4
London & Brighton .	1,050,000	1,007,000	+	43,000	4,142,000	4,189,000	—	60·7	57·6
London & N.-West. .	2,739,000	2,704,000	+	35,000	12,423,000	12,641,000	—	52·9	51·3
London & S.-West. .	1,426,000	1,403,000	+	23,000	6,200,000	6,236,000	—	55·2	54·0
Tilbury . . .	127,000	116,000	+	11,000	605,000	602,000	+	50·2	46·1
Metropolitan . . .	333,000	366,000	—	33,000	1,060,000	1,083,000	—	75·3	80·9
Metropolitan Dist. .	190,000	214,000	—	24,000	594,000	628,000	—	76·8	81·8
Midland . . .	1,658,000	1,581,000	+	77,000	9,005,000	8,944,000	+	44·2	42·4
North-Eastern . .	1,316,000	1,240,000	+	76,000	7,156,000	7,087,000	+	44·1	41·9
North London . .	161,000	166,000	—	5,000	1,008,000	1,009,000	—	38·1	39·3
North Stafford . .	125,000	125,000	—	—	600,000	618,000	—	49·9	48·5
Sth.-Eastern & Chats.	1,428,000	1,413,000	+	15,000	5,247,000	5,447,000	—	65·3	62·3
Total . . .	16,988,000	16,539,000	+	449,000	81,540,000	81,964,000	—	50·0	48·4
									+ 1·6

To show more clearly the improvement effected, we set out in Table C the percentage increases or decreases in earnings in mileage and in earnings per mile of the goods trains of the past half-year, as compared with first half of 1900 :—

TABLE C

	Goods Trains		
	Earnings. Increase or Decrease	Mileage. Increase or Decrease	Earnings per train mile. Inc. or Dec.
	%	%	%
Furness	- 14.8	- 11.0	- 4.1
Great Central	- 5.2	- 5.8	+ 0.6
Great Eastern	- 1.1	- 3.6	+ 2.5
Great Northern	- 5.2	- 9.0	+ 3.7
Great Western	- 1.4	- 4.6	+ 3.2
Hull & Barnsley	- 14.0	- 18.7	+ 4.7
Lancashire & Yorkshire	- 3.0	- 8.7	+ 6.2
London & Brighton	- 0.2	- 2.4	+ 2.2
London & North-Western	- 2.8	- 5.5	+ 2.7
London & South-Western	+ 0.5	- 1.6	+ 2.1
Tilbury	+ 2.0	+ 3.2	- 1.2
Metropolitan	+ 1.8	- 14.9	+ 19.7
Metropolitan District	—	—	—
Midland	- 4.6	- 3.7	- 0.9
North-Eastern	- 4.0	- 7.5	+ 3.9
North London	—	- 2.7	+ 2.7
North Stafford	- 2.1	+ 0.8	- 2.9
Sth.-Eastern & Chatham Jt. . . .	+ 0.5	- 0.5	+ 1.0
	- 3.2	- 5.4	+ 2.2

And in Table D we give the percentage increases or

decreases in earnings, in mileage, and in earnings per mile of the passenger trains :—

TABLE D

—	Passenger trains		
	Earnings. Increase or Decrease	Mileage. Increase or Decrease	Earnings per train mile. Inc. or Dec.
	%	%	%
Furness	+ 6·8	—	+ 6·8
Great Central	+ 9·7	+ 1·1	+ 8·7
Great Eastern	+ 5·2	— 1·1	+ 6·1
Great Northern	+ 0·6	— 1·2	+ 1·8
Great Western	+ 4·6	+ 0·9	+ 3·7
Hull & Barnsley	— 7·2	— 5·9	— 1·3
Lancashire & Yorkshire	+ 0·8	+ 0·1	+ 0·7
London & Brighton	+ 4·3	— 1·1	+ 5·4
London & North-Western	+ 1·3	— 1·7	+ 3·0
London & South-Western	+ 1·6	— 0·6	+ 2·2
Tilbury	+ 9·4	+ 0·5	+ 8·9
Metropolitan	— 9·0	— 2·1	— 6·9
Metropolitan District	— 11·2	— 5·4	— 5·8
Midland	+ 4·9	+ 0·7	+ 4·2
North-Eastern	+ 6·1	+ 0·9	+ 5·2
North London	— 3·0	—	— 3·0
North Stafford	—	— 2·9	+ 2·9
Sth.-Eastern & Chatham Jt.	+ 1·1	— 3·7	+ 4·8
Total	+ 2·7	— 0·6	+ 3·3

For the purpose in view the important figures in the above tables are the percentage increases in the goods and passenger train earnings per mile. It will be noted that out of eighteen systems only four have

failed to increase their goods earnings per train mile—the Furness, the Tilbury, the Midland, and the North Staffordshire—and in two at least of these four—the Furness and the Midland—the effort to reduce train mileage in proportion to the receipts did not succeed owing to the heavy shrinkages in gross earnings. Of the more important companies which did augment their goods earnings per train mile the Lancashire and Yorkshire was by far the most successful, its earnings per goods train mile having increased 6·2 per cent. The North-Eastern came next with an increase of 3·9 per cent. in its goods earnings per train mile, the Great Northern followed with 3·7 per cent. increase, the Great Western with 3·2 per cent., the London and North-Western with 2·7 per cent., the Great Eastern with 2·5 per cent., and the South-Western with 2·1 per cent. Even the Brighton and South-Eastern with their light goods traffic succeeded in somewhat increasing their earnings per train mile. Too much should, however, not be made of the actual earnings of individual companies per train mile. The increase is the important matter at the moment. Of course, had all the Companies similar proportions of high and low class traffic and similar lengths of haul, the actual earnings per train mile would be of great interest; but to take the earnings per train mile without considering all the factors which enable a company to earn a large

or small sum per train mile would be misleading. We trust, however, that, in the not distant future, railway companies will see their way not only to compile, but to publish the information we ask for in Chapter VII., in order that honour can be given to those able railway officials to whom honour is due, and that those responsible for the less well-managed lines can ascertain more accurately what other Companies can accomplish in the way of earnings per train mile, and can see that their properties give similar results. It will be apparent that we are justified in marking the improvement which each Company can effect in its train mileage compared with its own results in the past, and in contrasting the improvement effected by the various lines one with another.

Now if this saving in train mileage can be effected in one half-year when the movement for heavier train loads and cars is yet in its infancy, what may ultimately be accomplished? The average increase of 2·2 per cent. in the loading of goods trains has been accomplished in face of a decline of 3·2 per cent. in the quantity of traffic moved as indicated by the shrinkage in earnings, with refuge sidings not yet extended, with the plans for improving transshipping facilities still in embryo, with engines of a little or no more power than they were last year, with waggons of no greater capacity and with the usual difficulties thrown in the way of the working out of new ideas by

the rank and file of railway servants, upon whose co-operation the attainment of larger train loads in some degree depends. Moreover, it has been accomplished without that statistical information in the hands of railway managers essential to the efficient direction and control of labour, of machinery, and of rolling stock. Only when railway managers possess detailed information of the amount, nature, and profitableness of every class of traffic arising on every portion of their systems can they devise plans for handling it in transit, at the terminals and at transshipment centre, with the least waste of car and engine mileage, of machinery power, of labour and of time.

In all movements for increasing the efficiency of labour and of capital the great difficulties are experienced at the start, and inasmuch as the movement is now fairly on the way, we are justified in anticipating that very important results will ultimately be attained, and in affirming that the immense loss of profit now being experienced by our railways will be a small price to pay for the advantages which will eventually accrue to the Companies and to the nation from greater efficiency and greater economy.

CHAPTER. XII

MR. GREEN ON THE RAILWAY POSITION

To the Editor of 'The Statist'

‘SIR,—Now that railway dividends have been announced and the half-yearly meetings held, it is, I think, a fitting time for shareholders to take stock of their position, and the sooner they do this the better. The serious reduction in our dividends does not require arguing, we are all painfully aware of it; but what we have to consider is, whether this severe depreciation is to be followed by recovery, or to be continued with, perhaps, a still further decline. To enable us to come to a right judgment, it is essential we should carefully read the speeches of the chairmen of our leading Companies, and in doing so it will, I think, occur to most there are two impressions left in most of these speeches that are somewhat misleading—the first is, that the fall in dividends is almost entirely due to the rise in coal, and the second, that whatever may be the cause of this decline, it proceeds from circumstances over which the directors have no control. I respectfully

beg to take exception to both these suggestions. With regard to the first, I need only point out that dividends had begun to decline before the great advance in coal took place, and it is patent to everyone that the important drop that has now occurred in the price will not be sufficient to restore dividends to their former level. To discuss the second impression it will, I think, help us if I first of all state the chief causes that have led to such disastrous results on railway dividends. These I take to be the following :—

‘The advance in the price of coal and other materials.

‘The increase in wages, coupled with shorter hours.

‘The large increase that is year by year taking place in rates and taxes.

‘The great outlay that is constantly going on to meet the additional demands of Government.

‘The increasing opposition of electric tram-cars.

‘The unnecessary train mileage.

‘The very large yearly capital expenditure.

‘And, above all,

‘The unnecessary, and in many cases ruinous, competition.

‘I think it will be admitted these embrace the main causes of our misfortunes, and what I contend is that, with the exception of the first named, the

price of coal, there is not one that directors might not exercise some influence over. Take, for example, wages, rates and taxes, Government demands and tram-car opposition—each one of these receives legislative support more or less, and it requires Parliamentary influence to be brought to bear to keep these demands within reasonable bounds, and this can only be done effectually by railways making combined and united representations, backed, as they should be, by the great body of the shareholders. Unfortunately, our various boards seem entirely to ignore that well-established maxim, “Unity is strength.”

‘But when we come to consider the three remaining causes, namely, unnecessary train mileage, unnecessary increase in capital, and unnecessary competition, which to my mind are the most important, I say distinctly they are entirely within the control of directors. But here again these can only be avoided by united action on the part of our railways; and again, unfortunately, past experience forbids one to hope this harmony will ever be attained unless some outside pressure is exercised. These three are in a great measure answerable for reduced dividends, and for them directors alone are responsible.’

‘Several railway chairmen have expressed a desire to have the more active support of shareholders, and in no way can this support be more advantageously given than in helping to put a stop to reckless competi-

tion, which is the cause of much of our capital expenditure, and is at the root of the enormous increase in working expenses; which have gone up from 52·2 in 1888 to 64·6 per cent. last half-year. It would occupy sadly too much of your space to go into the many details where this competition comes in, but every railway manager knows how it ramifies into every department. Scores of unnecessary concessions have been made, which, when adopted by one company, must be followed by others, and these in the aggregate entail a very huge expenditure. I am not for a moment advocating that every reasonable facility should not be given to the travelling and trading public. We must treat our customers liberally, but if this is to be done at the expense of a profitable employment of shareholders' capital, the public are bound to suffer in the end.

‘One word more as to the enormous waste of money that is daily taking place in running needless trains, and I say this notwithstanding that some reduction has already been made. If anyone wants proof of this he need only make half an hour's study of Bradshaw. Let him work out the number of trains that are being run daily by the four great companies from London to Scotland, Lancashire and Yorkshire, and, again, in many districts in the West Riding, notably between Leeds and Bradford—no sane man will say all these trains are required. On

the contrary, many are merely run by competing Companies trying to filch each other's custom. This waste of money is a scandal to our railway management, and if anyone can suggest how these necessary reforms are to be brought about without the intervention of shareholders, I for one shall be grateful; but in the absence of that, I say it is imperative on shareholders that they should combine to take action in this matter.

‘This letter is, I fear, already so long I cannot do more than refer to the great service you are rendering to railway shareholders by your articles on “The British Railway Position,” and especially in urging the great saving that may be effected by following the example of American railway management in increasing the hauling capacity of engines and waggons. It is no answer for our chairmen to say that because the length of journey on English railways is so much less than that of American railways nothing can be done in this direction. Something can and ought to be done, and notwithstanding the unpromising appearance of prospects at present, I believe that thanks to your persistent advocacy and the arousing of shareholders we shall soon see some great economies in railway working will be introduced.—I am, yours &c.,

‘RICHD. GREEN.

‘The Whittern, Kington, Herefordshire:

‘August 27, 1901.’

CHAPTER XIII¹HOW TO OVERCOME THE DIFFICULTY IN INTRODUCING
WAGGONS OF GREATER CAPACITY—THE ECONOMY OF
LARGE WAGGONS

EVIDENCE accumulates that our railways are steadily learning to appreciate the advantages of adopting the most modern methods of railway working, as practised with great advantage by the railways of the United States in recent years. In our issue of August 24 we drew attention to the announcement by Sir George J. Armytage, Bart., of the adoption by the Lancashire and Yorkshire Railway 'of a system under which goods trains are made up to a tonnage basis equal to the haulage capacity of the engine, and not, as hitherto, upon a given number of waggons—a measure which enables us to utilise our locomotive power to the fullest extent and to reduce the number of trains running over the system, thereby not only effecting a saving in running expenses, but relieving the congestion which prevails at many points of the line.' We now have the chairman

¹ This article appeared in *The Statist* of September 28, 1902.

of the Caledonian Railway, Sir James Thompson, declaring that his Company has all along pursued American methods, and, what was more satisfactory, announcing the intention of the Caledonian to adopt the latest methods. As the reader is doubtless aware, Sir James Thompson has a very high reputation among railway men in this country, and an almost unequalled experience of railway working, having been in the service of his Company for fifty-four years, and having occupied the post of general manager for eighteen years. Sir James's acceptance of the principle of large cars, powerful engines, and heavy train loads is, therefore, a matter of importance, and his support is likely to carry the movement a long way.

Sir James assured his shareholders that what are called American methods are really methods which have been long recognised in railway circles in this country. These, he said, consist, firstly, of the provision of larger terminal or station accommodation; secondly, of the widening of the lines, or doubling the tracks, as the Americans style it; thirdly, of the introduction of locomotives of large tractive energy; fourthly, of the introduction of waggons of large carrying capacity. To show that the Caledonian had kept pace with the times with respect to all these matters, he referred to the contract for extending the terminal accommodation for passenger traffic at the Central Station, Glasgow,

which is now proceeding; the purchases of property for the extension of the principal goods station in Glasgow, and with the view to ultimately improving the Buchanan Street passenger station; to the widening of several sections of the line in busy centres, and to the proposed further widenings. As regards powerful locomotives, Sir James pointed out that the locomotives on the Caledonian will bear favourable comparison with the engines running *on any railway in Great Britain* in respect of either haulage capacity, speed, or durability; and as regards larger capacity waggons, he pointed out that the carrying capacity of waggons of 6, 7, or 8 tons of coal or iron ore have for some time been superseded by 'what we now call our standard mineral wagon, carrying 10 tons of coal or 14 tons of iron ore.' Sir James, in fact, conclusively proved that his line had been conducted on the best principles hitherto governing British railway practice, and which at one time were accepted as the acme of perfection in other countries. Of course Sir James could not show that the Company had been living up to the principles which have in recent years been accepted abroad. The practice which the Lancashire and Yorkshire has now adopted of making up train loads to a tonnage basis equal to the haulage capacity of the engine, of using large waggons, and of constructing engines capable of hauling upwards

of 1,000 tons, has but recently been considered. But what Sir James could and did show, was that he and his Company are prepared to adopt any method found to be advantageous; that he is willing—indeed, anxious—to put into practice the new theories; that he has already ordered fifty waggons, each capable of carrying 30 tons of coal or 50 tons of iron ore, and that in carrying out new works at Grangemouth Harbour the Company intends to provide facilities for handling the heavier cars. In other words, the Company in the past has followed the most approved British methods; it is now about to adopt some of the improvements which the Americans have built upon these methods.

But Sir James now finds that he cannot adopt these new methods as rapidly as he wishes. His important remarks on this point should be carefully noted:—

[‘What I have said will indicate that your directors have been, as circumstances permitted, moving with the times in the adoption of waggons of increased capacity. It will, however, naturally occur to many to ask, Why have you not introduced 20 and 30 ton waggons, and by this means raised the live load of traffic in proportion to the dead weight of plant, increased the size and reduced the number of trains, and effected savings in the working cost, as the Americans have done? The question is

natural and the answer is simple. In America the shipping ports and iron and steel and other works have grown up side by side, and at the same time the railways and the appliances at the ports and works have been made to fit in with the modern appliances of the railway companies, while in this country the Companies had to adapt their appliances to the old and crude conditions already existing at the ports and works, or started while railways themselves were in their infancy, *and the difficulty British railways have now to contend with is not simply to reform their own methods, but to wait for the alteration and improvement of the established conditions of the country.* To put the matter in a nutshell, there is not, at the present time, a single shipping port, iron or steel work, or gaswork, or any work in Scotland, capable of dealing with a waggon of a carrying capacity of 30 or even 20 tons of coal, and there are not half a dozen collieries in Scotland whose appliances for separating coal are capable of admitting a waggon of the height of a 30-ton waggon.']

Of course Sir James could not do otherwise than put the matter of the appliances of shipping ports, iron and steel works, gas and other works from a railway point of view when he said, 'The difficulty British railways have now to contend with is not simply to reform their own methods, but to wait for the alteration and improvement of the established

conditions of the country.' But may we not with reason ask, Are not the railway regulations with respect to the size of traders' waggons and the restriction of their capacity to 10 tons responsible for the fact that so few works have built appliances capable of taking larger waggons? What good would it have been to provide such appliances when there were no large trucks to handle, and when the railway regulations practically prohibited their use? Further, we would ask, Can Sir James Thompson, or any other railway chairman, expect traders to alter their appliances so long as under the existing regulations and specifications as drawn up by the Companies themselves they are still practically prevented from using large trucks? Doubtless many of our readers are fully cognisant with the regulations laid down for the construction of traders' waggons, but for the benefit of the less well-informed we reproduce the regulations governing the dimensions of a standard waggon.

Dimensions

'No waggon to exceed 8 feet wide over all, nor to exceed height 10 feet at the sides and 11 feet 6 inches in the middle, above the top of the rails. The length of coal waggons not to exceed 16 feet over headstocks. Coke waggons may be made 17 feet 6 inches over headstocks. The wheel base not to

be less than 7 feet 6 inches, nor to exceed 9 feet. The load not to exceed 10 tons.'

Now that the railway companies recognise the economy resulting from the use of the large waggons, revised waggon specifications will doubtless be drawn up; but we may point out that the longer the delay in issuing new regulations, the longer will be the time occupied before traders acquire larger trucks for themselves, and before they alter their appliances to accommodate these trucks. The construction of larger waggons and the provision by traders of facilities for handling them naturally involves the further question, What inducements are to be offered to traders to spend capital for the purpose of modifying their appliances? That the use of larger waggons by the railway companies will be of great advantage to them is not open to question. Larger trucks will greatly reduce the dead weight of the cars in proportion to the load, they will greatly reduce the weight of the empty cars, and they will enable a very large increase in the train load to be effected, as they will occupy much less space than a number of small cars having in the aggregate an equal capacity.

Of course, no one is in a better position than the various railway companies to know what each can offer to traders to induce them to accommodate and to use 15, 20, 25, or 30-ton trucks in place of the

existing 10-ton standard truck; but it is obvious that the railways can afford to give inducements, and still secure a larger profit from handling the traffic than by existing methods. Roughly speaking, a 30-ton truck weighs only $13\frac{1}{2}$ tons, whereas a 10-ton standard truck weighs 6 tons 7 cwt. Three standard 10-ton trucks thus weigh 19 tons 1 cwt., or $5\frac{1}{2}$ tons more than the 30-ton truck.

This represents a saving in the weight of a full load of over 10 per cent., and in the weight of the empty trucks of 26 per cent. Further, the length of a 30-ton truck is very much less than three 10-ton trucks, and consequently a much larger train load can be secured without increasing the length of the train—a matter of very great importance.

Of course, it is impossible for our railway companies yet to make experiments to ascertain how much the actual saving in the cost of conveying the larger trucks, as compared with the existing small trucks, will be, but the experience of American lines affords them some guide, and they may find of value the following results of a practical investigation made early in 1901 by Mr. F. F. Gaines, mechanical engineer of the Lehigh Valley Railway, and presented to the New York Railroad Club on May 16. The paper was reproduced in the *Chicago Railway Age* of May 31. Mr. Gaines maintained that the hauling of short trains of large cars is more economical than

the movement of long trains of small cars in many ways.

To make this clear Mr. Gaines presented two tables, given below, showing the operation of five test trains. In these tests the trains were hauled by the same engine over the same division, the number of loaded cars being respectively 36, 37, 47, 55, and 66, and the corresponding nominal capacities 50, 40, 30, 25, and 20 tons per car. With regard to revenue load, the results were as follows:—With the 36-car train, 1,824 tons; 37-car, 1,527 tons; 47-car, 1,364 tons; 55-car, 1,354 tons; 66-car, 1,336 tons. The two trains with 36 and 37 cars had total lengths of 1,209 and 1,249 feet respectively, while the 55-car train ran up to 1,632 feet. Trips 1, 2, and 3 burned practically the same amount of coal per trip, and Nos. 4 and 5 more coal with a much smaller paying load.

It is to be regretted that we have not the results of moving a train laden with 10-ton waggons under similar conditions, but the lesson to be learned from the following results is unmistakable.

Consequently, to remove the difficulties which Sir James Thompson now finds confronting him in the use of large cars, and in effecting the consequent economies in expenses, action must be taken by the railways of the country in two directions. Firstly, they have to modify their standard waggon regulations by increasing the limit of size from 10 tons to

1	2	3	4	5	6	7	8	9	10	11	12
Test train Number	Number of loaded cars in train	Nominal capacity	Weight of one car and contents (average)	Total weight of all cars and contents (gross) weight	Light weight of all cars (tare weight)	Revenue load	Coal burned on trip	Coal burned per trip in per cent.	Total train length excluding engine and caboose	Gross weight per cent. (gross weight of train = 100)	Revenue weight per cent. (revenue weight of train = 100)
TABLE I.—Actual Results											
		Tons	Tons	Tons	Tons	Tons	Lb.		Feet		
1	36	50	70	2,500	676	1,824	18,264	100	1,209	125	133.70
2	37	40	60	2,207	680	1,527	18,457	100	1,249	110.35	111.95
3	47	30	42.5	2,000	636	1,364	18,242	100	1,540	100	100
4	55	25	36.4	2,003	649	1,354	19,511	106.5	1,632	100.15	99.27
5	66	20	30.5	2,012	676	1,336	19,659	107.3	1,958	100.6	97.95
TABLE II.—Virtual Results (on basis of equal coal consumption)											
		Tons	Tons	Tons	Tons	Tons	Lb.		Feet		
1	36	50	70	2,500	676	1,824	18,264	100	1,209	125	133.70
2	37	40	60	2,207	680	1,527	18,457	100	1,249	110.35	111.95
3	47	30	42.5	2,000	636	1,364	18,242	100	1,540	100	100
4	52	25	36.4	1,873	607	1,266	18,321	100	1,543	93.65	92.82
5	61	20	30.5	1,865	627	1,238	18,321	100	1,810	93.25	90.76

15, 20, 25, and 30-ton cars; and, secondly, they have to agree upon the concessions in rates which can with advantage be made to those who, having altered their appliances both for the despatch and the reception of larger cars, offer traffic in large car loads. The matter rests with the railways.

CHAPTER XIV

AN INDIAN RAILWAY EXPERT ON HEAVY TRAIN LOADS
AND LARGER WAGGONS

THE following letter¹ from an expert engineer, who could speak with authority upon Indian railway working, was published in *The Statist* of October 7, 1901 :—

To the Editor of 'The Statist'

‘SIR,—The subject of your article in your issue of September 28 on “The British Railway Position” is not a new one to those connected with Indian railways.

‘In respect to waggon loads, a fact to which you do not call attention, and are, perhaps, not aware of, is that all American waggons are carried on eight wheels. All English, as you know, are carried on four wheels. Whether the bogie frames required for eight-wheeled waggons are worth the complication of design, and consequent cost they involve, is a question on which there is room for difference of opinion. I think I may say that most of those

¹ We refer to this letter in Chapter XXVII., p. 307.

Indian engineers who have to deal practically with it are, so far, on the side of the four-wheeled waggon.

‘The main point is the weight which can be put with advantage on a pair of wheels, *i.e.* on one axle. Both here and in America until lately, although there has been no hesitation in raising the weight put on an engine axle from about 8 to as much as 18 tons, the increase on waggon axles has only been from, perhaps, 5 tons to 8 tons, and no English manager seems yet to have realised that a much nearer approximation may be made to the present load on the engine axle.

‘In India we are much further advanced. We have for some years recognised that there is no objection to 12 tons on a waggon axle, and we would go somewhat further but for restrictions put upon us by the Government of India in respect to the strains to which some of our iron bridges would be subjected.

‘However, with 12 tons per axle we now build or rebuild all open four-wheeled waggons of size and strength equal to loads of more than 17 tons of minerals, and would take nearly 18 if we were allowed to use wheels 2 feet 9 inches as in America, or 3 feet as in England, instead of 3 feet 7 inches, and the average capacity of waggons on the East Indian Railway is now nearly 15 tons, and is rapidly increasing.

‘If four-wheeled waggons of 18 tons capacity were used here, it may be doubted if it would be worth while to introduce the American eight-wheeled waggon; for it must be borne in mind that this waggon would require the gradual reconstruction, not only of the whole of the present waggon stock, but the immediate reconstruction of much more of the existing plant of coal docks than the mere enlargement of the present waggons.

‘In respect to train loads, India is a long way in advance of England, and was for some years nearly abreast of America, but America seems lately to have gone somewhat ahead of her. Still, I find from your last issue that the train-loads on the Atchison line were not very much in excess of those on some of the Indian lines—242 (American?) tons against about 200 (English)—and that, notwithstanding the American waggons were eight-wheeled and the Indian only four, the Atchison waggon load was only 12·6 (American?) tons against over 10 tons (English) on the East Indian Railway. The American ton, it will be remembered, is only 2,000 lb. Even if the Americans be in advance of India, something is to be attributed to the greater quantity of American transport, for quantity governs in no small degree both train and waggon load.

‘What is wanted now in India, and will be wanted here, for increased train load is more brake power.

The brake power afforded by engine, tender, and brake vans is scarcely sufficient for the control of the present trains on crowded lines. They would be quite insufficient for heavier trains. The present standard mineral train on the East Indian Railway is, I may mention, 1,000 tons gross behind the engine.

‘I am, yours obediently,’

‘P. Q. R.’

‘8 Great George Street, Westminster, S.W.:

‘October 2, 1901.’

Our comment on the foregoing letter was as follows:—

‘Our correspondent must not take the Atchison train load as a sample of what is accomplished in the United States. Although it is being steadily raised, the Atchison’s load of 242 tons is still one of the lowest. The Pennsylvania’s average revenue load in 1900 was 484 tons, the Lake Shore’s 455; the Chesapeake and Ohio, in the twelve months to June 30, 1901, had an average revenue load of 511 tons (and a total load, including Company’s freight, of 533 tons), the Norfolk and Western of 435 tons, and many others have loads of nearly 400 tons. Consequently the Indian load of 200 English tons is now a long way behind the American, though some three times greater than the English. Our correspondent affirms, with knowledge, that “most of those Indian engineers who have to deal practically with it are, so

far, on the side of the four-wheeled waggon." Of course, the question of the friction of wheels and the rigidity of trains is a matter for engineering experts. We would point out, however, that American engineers who have had very wide experience of both classes of waggons have discarded the four-wheel for the bogie eight-wheel cars. They claim that the friction of a train of bogie cars is very much less than the friction of a train of four-wheel trucks—that, indeed, the former is flexible, and the latter rigid, and that this means ability to haul greater loads with the expenditure of less coal and with less damage to the permanent way. The ability of American roads to haul gross train loads, including tare, of upwards of 3,000 tons at a very low cost, and the talk of still larger loads, seem to indicate that Indian engineers would do well to adopt the bogie waggon more extensively.

‘It cannot be denied that one of the obstacles to larger train loads in this country is the fact that our railways and traders possess an enormous quantity of small trucks, which they may not willingly discard. Although they may gradually acquire waggons of large capacity as they need new rolling-stock, such a process of increasing the capacity of their stock would be extremely slow. The suggestion of our correspondent that the existing trucks should be rebuilt on the basis of increasing the weight on a

waggon axle much in proportion to the increase in weight that has already been made on an engine axle, therefore deserves the careful consideration of managers and engineers who are desirous of increasing the capacity of their waggon stock, but who are indisposed to sacrifice capital by shelving light trucks. But while the suggestion to increase the capacity of existing waggon stock should receive the careful attention of railway managers, we trust that no delay will occur in reconstructing the appliances at coal docks and collieries, and at iron, steel, and other works, in order to handle large-capacity waggons with maximum economy.

‘We agree with our correspondent that “what is wanted now in India, and will be wanted here, for increased train load is more brake power.” Heavier train loads are essential, but it is of the utmost importance that the heavy trains should be under absolute control on a down grade.’

CHAPTER XV

THE ESSENTIALS TO PROSPERITY

THAT the prosperity of the railway industry is governed by the prosperity of the country requires no proof. Our railways, with their enormous capitalisation and restricted power of charging for services, cannot be prosperous unless the country is doing well. Bad trade means relatively small receipts from both goods and passengers. On the other hand, it is possible for the country to do well without the railways deriving corresponding advantage if the cost of moving traffic is in excess of, equal to, or even nearly equal to the remuneration received for the services performed. Or, again, the railways may do badly when trade is active if they expend such large amounts of capital for extending and improving their systems that the quantity of traffic, even with a fair rate of remuneration, is insufficient to give them enough of net earnings to pay the interest upon the additional capital outlays. Thus our railways cannot earn good profits if trade is slack and the quantity of traffic is small, and they

may earn small profits even when the country is prosperous, as shareholders have recently discovered. The railways of this country have been built and improved on the theory that the prosperity of the country must grow, that the quantity of goods and passengers to be transported will always increase, and that the rates of remuneration to be received for transport will be sufficiently high to give a fair margin of profit with good management. Consequently, if the prosperity of the country suffers, the profitableness of our railways is also affected, and the dividends earned upon their large capital is small. Experience has, of course, justified the theory that the prosperity of the country will receive no serious check, and that, with very slight intervals of what are termed depression, the business and prosperity of the country will constantly grow. Never since the early portion of the last century have we received any serious check to our prosperity: population has steadily increased, industries have rapidly expanded, and our wealth has accumulated in a marvellous manner. And there can be no doubt that this growth of population, of industries, and of wealth will go on indefinitely. Nevertheless, no one can ignore the fact that the nation has arrived at a crisis in its existence. Putting aside altogether the South African war, with its absorption of capital and

its disappointments, which for the moment are adversely, but only temporarily, affecting the well-being of the country, we have to face the fact that great competitors have arisen, with whom we shall, in the future, have to share trade which until the last few years was ours alone. No one who has watched the growth of the cotton manufacturing industry in the United States, on the Continent, in India, and in Japan can for one moment doubt that we shall never again supply the large proportion of the population of the world with cotton cloth as hitherto, and that we shall have to work hard to retain our fair proportion of the world's cotton trade. Those who mark the development of the iron and steel industries of the United States, of Germany, and of Belgium, cannot hide from themselves the unpleasant fact that we shall have great difficulty in maintaining our position in the iron trade. Those able to appreciate the wonderful progress of the United States in the production of machinery of all descriptions are certainly justified in their anxiety lest the engineering industry of this country has been eclipsed. The tinplate trade, of which at one time we had a monopoly, has already received a blow from the extension of the industry in the United States. Those in touch with our woollen and worsted trade are certainly uneasy lest France and the United States should take the position we formerly held, if

they have not already done so. In the boot and shoe trade we are now apparently outdistanced by the Americans and the French. Our chemical trade has had a most uncomfortable experience in recent years, both from the growth of the industry in the States and in Germany. So far as the production of cereals and of farm produce is concerned, we have long been outdistanced by the enterprise, the scientific methods, and the soil of other countries. Thus, although we believe that the country will rise to the occasion, will improve its education, and will change its business methods, and that consequently our trade, population and wealth will again expand, there can be no doubt whatever that uneasiness as to the future is justified, and that a period of depression will be experienced before we once again begin to move forward.

To give an idea of the enormous development of foreign industries as compared with our own in recent years, and the nature of the competition which so urgently calls for a change in our methods of working, whether as employers or employed, we present the figures relating to two of our principal industries. Firstly we show the production of pig iron in Great Britain and in other countries in the last five years and in 1890.

Pig-iron Production.

—	Great Britain		Other Countries		World's Output
	Tons	% of Total	Tons	% of Total	Tons
1900 .	8,908,000	23·4	29,100,000	76·6	38,000,000
1899 .	9,305,000	25	28,200,000	75	37,500,000
1898 .	8,817,000	25	26,700,000	75	35,500,000
1897 .	8,789,000	26	24,600,000	74	33,500,000
1896 .	8,563,000	27	23,000,000	73	31,500,000
1890 .	7,875,000	30	18,100,000	70	26,000,000
Increase in 10 years }	1,033,000 (13 %)		11,000,000 (61 %)		12,000,000 (46 %)

Here in 10 years our output has increased by only 13 per cent., while that of other countries has increased by 61 per cent. In the past four years, when our own production has been almost stationary, that of other countries has increased by 17 per cent.

Secondly we give the quantity of raw cotton used by the spinners of this and of other countries in the past season, 10 years ago, and 20 years ago.

In 1900-1 our spinners have required 3 per cent. *less* cotton than they did 10 years ago, while the spinners of other countries have needed no less than 37 per cent. *more* than 10 years ago.

Contrasted with 20 years ago our spinners have consumed only 14 per cent. more, while those of

Consumption of Cotton by Spinners.¹

	Great Britain	Continent, U.S., East Indies	Total
	Bales	Bales	Bales
1900-1	3,269,000	9,557,000	12,826,000
1890-91.	3,384,000	6,959,000	10,343,000
1880-81.	2,858,000	4,356,000	7,214,000
Increase or Decrease, 10 years {	-115,000 -3%	+2,598,000 +37%	+2,483,000 +24%
Increase, 20 years . {	411,000 14%	5,201,000 119%	5,612,000 78%

¹ According to the calculations of Messrs. Ellison & Co., of Liverpool.

other countries have increased their consumption by 119 per cent. !

But it may be asked, Why has trade been so extremely active in recent years if we have been thus outdistanced by our competitors? In reply we would point out that our recent prosperity was caused, not by any appreciable growth in our manufacturing industries, but by the unprecedented and abnormal amount of capital invested at home (the supply of which has now greatly diminished) and to our more extravagant mode of living, which has caused enormous expansion in our imports. Consequently it follows that if the outlay of capital upon the building of houses, upon the extension and improvement of our railways, upon public works by our municipal and other authorities, upon ships of war, upon the mercantile marine, upon the extension

of electrical enterprises, &c., does not continue on the large scale experienced in recent years—and there is already serious slackening—then trade must show marked contraction until improvement in our methods of production and our greater economies begin to bear fruit, and we are again able both to invest largely and to secure a larger share in the world's trade.

And the slackening in trade and in the prosperity of the country must for a time affect adversely the gross earnings of our railways. Thus the outlook is for shrinkage in both the passenger and in the goods earnings of our railways, and for renewed expansion only when we have improved our methods, and when confidence that we can hold our own in the world's markets is restored.

It is, however, an encouraging sign that opinions are so freely expressed, and convictions are so firmly held, that we must change our methods. If everyone is imbued with the conviction that our future prosperity depends upon individual effort, that the time is passed for our railways, our manufactures, and our traders to work on antiquated principles, or for workmen to receive a full day's wage for less than a full day's work, or to give less than their best work, then the period of contraction will be relatively short, and in a comparatively short time we shall

again secure our due share of the world's expanding trade. Hence there are good grounds for the hope that the contraction in the gross earnings of our railways may be of comparatively short duration.

CHAPTER XVI

THE COMPETITION OF ELECTRIC TRACTION

IN the foregoing we have shown that our railways cannot secure large gross earnings if trade is bad and the movement of capital is sluggish—as it is now. But there is another matter which is exercising the minds of the thoughtful. On every hand electric traction is extending, and it is feared that the competition of electric tramways and railways will seriously reduce the earnings of steam railways. So far as electric tramways are concerned, we hold the opinion that they are likely to increase rather than to reduce railway earnings, and that they are of immense advantage to the community. That they will compel some of our railways to change their method of working suburban traffic in our large towns from steam to electricity is very probable, but this will prove of great benefit to the railways. Who can doubt that the Metropolitan and the Metropolitan District Railways will be at least as prosperous as they were when their motive power has been changed from steam to electricity? or that

their gross earnings will not very greatly expand? Inasmuch as speed is the potent factor in deciding the means by which passengers will be conveyed from place to place, few will prefer to travel in electric tramcars stopping every few yards if, with equal convenience, they can travel in trains which stop only once in every few miles. Electric tramways will moreover probably solve the workmen's trains problem, for municipalities will now have their own tractive power for carrying workmen at cheap fares to the suburbs. They are also likely to solve the industrial dwellings problem. There is unlimited room in the suburbs for workmen's cottages. Electric tramcars will convey workmen at very low fares and with moderate expedition from the suburbs to their employment. Hence there will no longer be reason for building barrack-like structures in densely populated districts. There seems, indeed, reason to anticipate that the extension of electric tramways will enormously increase the population in suburban districts, and that this will greatly increase the quantity of food, clothing, and freight of all kinds which will have to be conveyed by railway. Anxiety as to the effect upon railway earnings of the extension of electric tramways does not, therefore, seem to be warranted.

On the other hand, any development of high-speed electric railways will be a serious matter, and

the progress of the Mono-rail electric line from Liverpool to Manchester will be watched with very keen attention. In this case the high speeds of steam railways may be greatly surpassed. The directors and managers of our railway companies appear, however, to be keenly alive to the possibilities of electric traction, and were they convinced that steam traction for passenger traffic is no longer the more effective or the more economical power, they would probably not hesitate to substitute electricity. Indeed, Parliament, in its desire to be just, would doubtless give the existing lines the privilege of transforming their roads from steam to electricity, or of constructing parallel electric lines for passenger traffic, before it would sanction competitive electric ventures. But the economy of high-speed electric railways for long distances has yet to be proved. Since the foregoing was written a Bill has been deposited for the construction of a high-speed electric railway from London to Brighton, and it is understood that plans are being prepared for a high-speed electric railway between Glasgow and Edinburgh. In the interest of the community it is to be hoped that Parliament will give very careful consideration to the results which would follow upon the authorisation of electric railways to compete with the existing long-distance steam lines. That electricity will be the tractive power of the future can

scarcely be doubted, but in view of the enormous sums of money that have been spent upon providing the country with an admirable system of railways and the great advantage which would accrue to all concerned were the existing lines to be electrified, rather than that competing electrical railways should be built, the existing companies should first be given the opportunity of introducing electric traction before competing lines are authorised. The matter needs the most careful handling if the community is to derive the maximum of benefit and the minimum of loss from the progress of science in the matter of rapid and economical transport.

CHAPTER XVII

THE LONDON AND NORTH-WESTERN—I

THE affairs of this great Company merit more than usual attention. Firstly, as our leading railway, its methods of operation more or less govern the methods of many other lines with which it works in co-operation or in competition. Secondly, its business is vast, and its freight charges affect to a very considerable degree the profitableness of an enormous number of manufacturing and other undertakings; and, with foreign competition increasing, the influence of its charges upon the profits of manufacturers may become more marked. Thirdly, it has a capital greater than that of any other corporation in the United Kingdom, and its profitable working is a matter of concern to many thousands of investors. Thus it will be evident that at the present time of economic change affecting every side of its operation, it is necessary to discuss the conditions under which it works, what it is doing to turn these changes to advantage, and the possible improvement which may be effected in its profit-earning capacity.

To understand how its methods of operation affect those of other roads, it is necessary to appreciate its topographical position. Its line is the most direct route from London to Birmingham, Liverpool, Manchester, and Carlisle; in alliance with the Caledonian Railway, its route is the most direct from London to Glasgow, and it also has the direct route to Dublin. Further, its lines extend as far east as Peterborough and Cambridge, and as far west as Swansea, Carmarthen, and Holyhead. Its methods of operation, therefore, affect the Midland, the Great Western, the Great Northern, the Great Central, and further north they affect the Lancashire and Yorkshire and the North-Eastern. Smaller roads, including the North Staffordshire, are also interested. Any improvements in the London and North-Western's methods of working, either in passenger or goods traffic, must affect some or even all of these lines. In the past the influence of the London and North-Western upon the transportation industry has been altogether good. Its lines are well planned, well built, and well ballasted. Its rolling stock is of the best. Its train service is punctual. Its passengers are carried with expedition and with comfort, and its goods are delivered promptly. Of course, in testifying to the admirable manner in which the North-Western has been worked, we cannot ignore the fact that neighbouring lines have constantly

endeavoured to improve their geographical position and to reduce the time occupied by them in transporting passengers and goods from centres served by the North-Western, and that the Company has received constant stimulus to improve its service in order to retain its lion's share of the traffic. And we must also recognise that neighbouring and competing railways to the North-Western have been also exceedingly well managed from the English standpoint. Quick delivery has, in fact, been the goal at which all the Companies have aimed. In common with all the Companies, the North-Western did not consider the question of expense; its ideal was to give the promptest service possible to all classes of traffic, and thereby to attract to itself a large business. This is the true explanation of the remarks of Lord Stalbridge a few months ago, when he said: 'In this country a merchant in Manchester, Liverpool, Leeds, York, or any other of the big towns feels that he must receive in the morning the invoice of goods awaiting delivery that left London only the night before.' This is what the Company and others have endeavoured to perform, and evidently Lord Stalbridge thinks that, having given such a service, traders must need it. Of course, we appreciate that no Company wishes to, or should be asked to, give up any advantage it now possesses. But we would point out that a very large quantity of the traffic

carried is non-competitive, and, further, that the question of whether it is another day on the road is a small matter compared with the reduction in rates which could be granted by moving the traffic in greater loads. But even as regards competitive traffic there is another factor now to be taken into account. At the present time steamship charges for freight have fallen to extremely low figures, and the competition of water traffic—not only of coast districts, but of foreign countries—is likely to be much more seriously felt unless the railway companies, to some extent, reduce freight rates, which they can afford to do if they delay delivery somewhat, and carry goods in larger truck and train loads.

The Birmingham, Wolverhampton, Stafford, and other inland manufacturing districts may consequently be placed at a disadvantage unless the railway companies which serve them can reduce the cost of transport. And, of course, the railway serving these districts would equally suffer. The position, therefore, of the North-Western and other companies serving these districts is that they must either change their methods of working by introducing larger cars and heavier train loads, or they must see a larger share of the trade of the country flow to manufacturing districts in this and other countries more favourably situated with respect to transport facilities.

The reduction in the mileage both of passenger and goods trains in the first half of the present year testifies to the desire of the directors, Chairman, and General Manager of the London and North-Western to secure heavier train loads both of goods and of passengers, and it is probable that as great, and possibly greater, economy in train mileage will be effected in the current half-year. Further, we understand that the railway companies are now engaged in drawing up fresh specifications for the purpose of permitting traders to build waggons of large capacity. Consequently we do not doubt that in the course of a few years the London and North-Western will build up very much greater train loads than at present, and will be able to assist traders in the Midlands to meet the increasing competition from seaboard and other towns, as well as of foreign countries, by affording them concessions in rates with respect to traffic sent forward in large waggon loads. Moreover, the saving in waggon and train mileage may not only enable the Company to reduce rates, but may give it larger profits from the lower charges. Any action of the North-Western in this respect will, of course, be accompanied by similar action on the part of neighbouring lines.

How much train mileage the Company will be able to save it is, of course, quite impossible for anyone to predict; but we may indicate what seems to be a

reasonable expectation. Of its total traffic of 44,465,000 tons carried in 1900, 34,815,000 tons, or 78·3 per cent., were minerals, and only 9,600,000 tons, or 21·7 per cent., were merchandise. Much of the 19,000,000 tons of coal carried is doubtless needed by the coal merchants in comparatively small quantities, but a very large amount of coal and all the other mineral traffic—16,000,000 tons—is for great manufacturing firms, gasworks, etc., which individually consume a large quantity of coal, and which would doubtless provide the necessary facilities for handling large trucks if they were offered any inducement to do so, either in the form of reduction in rates or by the provision of self-emptying coal trucks, by which the cost of handling would be considerably reduced. In the new specifications for traders' trucks of large capacity provision will probably be made for self-emptying trucks for the carriage of coal, coke, iron ore, limestone, etc.

Below we set out the quantity of minerals and freight carried by the London and North-Western in 1900 :—

Mineral and Merchandise Tonnage

	1900 ¹ Tons	% of Total
Minerals	34,815,230	78·3
Merchandise and live stock	9,650,047	21·7
Total freight	44,465,277	100·0

¹ These figures are as supplied to the Board of Trade.

To show how the Company's earnings from merchandise and minerals have increased in the past five years we give the following contrast :—

Revenue from Freight Traffic

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
	£	£	£	£	%
Merchandise .	4,511,000	4,535,000	4,218,000	+ 293,000	+ 6.94
Live stock .	209,000	232,000	213,000	— 4,000	— 1.87
Minerals .	2,806,000	2,881,000	2,441,000	+ 365,000	+ 14.95
Total freight .	7,526,000	7,648,000	6,872,000	+ 654,000	+ 9.51

It will be noted that the increase in mineral traffic has been much greater in proportion than the increase in merchandise traffic. The increase, it may be pointed out, has been due to the exceptional activity of the coal trade by reason of the immense volume of trade all over the world, also by reason of the unprecedented demand for coal for shipping and naval purposes. Unfortunately, however, the coal trade has begun to suffer from depression, and may suffer to a more serious extent still, by reason of the extreme depression in the freight market, the increasing competition of other countries, and the fact that our export coal trade has to some extent been handicapped by the imposition of the 1s. per ton export duty. The mining districts to feel the depression in the coal trade most will be those of the

Midlands, which are farther from the seaboard than those of Northumberland, Durham, Scotland, and South Wales. It will consequently be appreciated that, in the interests both of the colliery owners and of the railway companies, every effort should be made to reduce the cost of transport, in order that Midland and other coal carried by the North-Western should be placed in the competitive markets at the lowest possible cost.

To show that the loading of freight trains in the past year differed little from that of 1896, when the quantity of traffic was much smaller, we contrast below the earnings and mileage of freight trains and the receipts of freight trains per mile in the years ended June 30, 1901 and 1900, and the calendar year 1896 :—

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
Earnings of freight trains .	£7,526,000	£7,648,000	£6,872,000	£654,000	9.5
Mileage of freight trains .	21,977,000	22,669,000	20,307,000	1,670,000	8.2
Receipts of freight trains per mile .	82.20d.	80.95d.	81.21d.	0.99d.	1.3

To show the quantity of traffic carried one mile,

and the average rates secured per ton per mile in 1900-1901, we give the following:—

—	1900-1	Rate per ton per mile	Tons carried one mile
	£	d.	
Merchandise	4,510,850	2·0	541,302,000
Live stock	209,423	3·5	14,630,000
Minerals	2,805,560	·7	961,900,000
Total freight . .	7,525,833	1·19	1,517,832,000

Thus, in the twelve months to June 30, 1901, nearly 1,518,000,000 tons were carried one mile in 21,977,000 train miles, and the average load secured by the London and North-Western was only 69 tons. This will be seen from the following:—

Freight-Train Results

Tons carried one mile	1,517,832,000
Train mileage	21,977,000
Train load	69·1 tons
Average rate per ton per mile . .	1·19d.
Earnings	£7,526,000
Earnings per train mile	82·2d.

Of course, it must be appreciated that a considerable quantity of train mileage was empty. Nevertheless, empty trains, and especially empty trains of small trucks, cost practically the same to work as full trains, and to obtain the average load it is, of course, necessary to include both loaded and empty trains. The Company has now built a con-

siderable number of engines of greatly increased capacity, both for passenger and goods traffic, with the object of increasing the loads of goods and minerals, and of avoiding the necessity of using assistant engines for heavy express passenger trains. These engines, we understand, are capable of moving a gross train load of about 700 tons, and a net mineral load of about 300 tons, under existing conditions of dead-weight, over any portion of the Company's system between London and Liverpool. Apart altogether, therefore, from the increase in the train load which will result from reducing the dead-weight by using larger waggons, a steady reduction in the goods-train mileage should be effected as the number of these greater-capacity engines is increased. We have pointed out that the average goods-train load is about 69 tons ; the average mineral train load is, of course, much greater than this. If we assume, as we may do, that the existing average mineral-train load is about 100 tons, including the return of the empty train, it would follow that the average load of merchandise and live stock is only 45 tons. In view of the more powerful engines now constructed, an increase in the average mineral-train load from 100 to 150 tons would appear to be feasible ; and that, allowing for the conditions affecting the transport of miscellaneous merchandise, an increase of 50 per cent. in the average load—from 45 tons to

67½ tons—should be possible. An improvement in the average goods and mineral train load from 69 to something like 103½ tons therefore seems a reasonable expectation. If such an increase occurs, it will of course mean that the goods-train mileage would be reduced from 22 millions to some 15 millions, or a saving of 33 per cent. To give an approximate idea of the average loads of merchandise and minerals, as well as the total average loads of goods (including empty trains), we give the following :—

—	Tons carried one mile	Train miles	Average load
Merchandise and live stock	555,932,000	12,358,000	Tons 45
Minerals	961,900,000	9,619,000	100
Total	1,517,832,000	21,977,000	69

The policy pursued with regard to passenger traffic has been similar to that adopted with the goods traffic. As business has increased the Company has in the past put on a correspondingly increased number of trains. Since 1896 the increase in the earnings of passenger trains has been 15·3 per cent. ; while the increase in the mileage of passenger trains has been 14·8 per cent. The increase in mileage would have been still greater in proportion to the increase in earnings had the Company in the first half of 1901 not devoted its attention to curtailing

mileage. In 1899–1900 the earnings per passenger train were, indeed, appreciably less than they were in 1896, the increase in mileage thus having been at a greater rate than the increase in earnings. Doubtless the large increase in passenger-train mileage last year as compared with 1896 was due to the steps which were taken to protect the Company's traffic in view of the opening of the Great Central's extension to London. Nevertheless, a considerable saving in the mileage of passenger trains now appears feasible. Below we contrast the earnings and mileage of passenger trains with the receipts of passenger trains per mile in the past two years and in 1896 :—

—	1900–1	1899–1900	1896	Increase 1900–1 compared with 1896	
	£	£	£	£	%
Earnings of passenger trains .	6,028,000	5,870,000	5,225,000	803,000	15·3
Mileage of passenger trains .	26,407,000	26,595,000	22,995,000	3,412,000	14·8
Receipts of passenger trains per mile . .	54·77d.	52·97d.	54·53d.	0·24d.	0·5

To show the descriptions of passengers carried, and the income received from parcels, horses, &c., and mails in the three years taken we give the table on the following page.

Receipts from Passenger Trains

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
First class . .	552,000	539,000	530,000	22,000	4·15
Second class . .	533,000	478,000	238,000	295,000	104·24
Third class . .	3,378,000	3,336,000	3,108,000	270,000	8·68
Season tickets .	336,000	323,000	272,000	64,000	23·52
Parcels, horses, &c.	1,014,000	984,000	885,000	129,000	14·57
Mails . . .	215,000	210,000	192,000	23,000	11·98
Total . .	6,028,000	5,870,000	5,225,000	803,000	15·36

From the above the very large percentage increase in the receipts from second class passengers and the relatively small increase in the earnings of first class and third class passengers will be noted. The marked improvement in the Company's second class earnings in recent years owing to the reduction in second class fares has thus drawn traffic both from the first and third classes. To show the number of passengers carried, and the passengers carried one mile, we give the following calculations, basing the mileage on average fares of 1·7*d.* per first class passenger per mile, 1·1*d.* per second class, ·9*d.* per third class, and ·35*d.* for season tickets. The average fare per passenger per mile works out at ·87*d.*

To ascertain the average number of first, second, and third class passengers per train it is necessary to analyse the receipts from season tickets. The detailed

Passenger Mileage, Year ending June 30, 1901

—	Number	Receipts	Rate per passenger per mile	Passengers carried one mile
		£	d.	
First class . .	1,937,984	552,039	1·70	77,933,000
Second class . .	5,228,561	533,445	1·10	116,388,000
Third class . .	79,844,725	3,377,455	·90	900,654,000
Season tickets . .	102,212	336,287	·35	230,596,000
Total . .	87,113,482	4,799,226	·87	1,325,571,000

figures of season tickets for the twelve months to June 30, 1901, are not available. But the receipts for the twelve months to December 31, 1900, did not materially differ from those of the twelve months to June 30.

We give below the season-ticket receipts from first, second, and third class passengers in 1900 and the approximate receipts per passenger per mile, with the passenger mileage of different classes :—

Season Tickets, 1900

—	Receipts	Receipts per passenger per mile	Passengers carried one mile
	£	d.	
First class	144,000	·42	83,000,000
Second class	61,000	·35	42,000,000
Third class	114,000	·27	101,000,000
Total	9,000	·35	226,000,000

In this manner we are able to ascertain the total number of ordinary and season first, second,

and third class passengers per train mile, and the total load of passenger trains. Less than three ordinary first class passengers are carried in each train, only 4·4 second class passengers, and only 34·1 third class—a total of 41·4. Including season tickets, for which the average fares are very low, the total number of first class passengers per train is six, of second class six, and of third class under 38, making the total average passenger-train load 49·9. Of course, season-ticket holders travel in large numbers in a few trains. Any reduction in the number of season-ticket trains would not be possible. But a very considerable saving in the mileage of ordinary passenger trains appears feasible, and, in view of the necessities of the case, doubtless the North-Western will effect a marked diminution. Below we set out the approximate number of first, second, and third class passengers per train mile :—

Average Passenger Train Loads

Passengers per train	Ordinary tickets	Season tickets	Total
	No.	No.	No.
First class	2·9	3·1	6·0
Second class	4·4	1·6	6·0
Third class	34·1	3·8	37·9
Total	41·4	8·5	49·9

On the next page we summarise the results of the passenger-train working.

Passenger-Train Results

Passenger mileage	1,325,571,000
Train mileage	26,407,000
Number of passengers per train mile	50
Average rate per passenger per mile	·87d.
Passenger earnings	£4,799,000
" " per train mile	43·6d.
Total earnings of passenger trains	£6,028,000
" " per train mile	54·7d.

Were the number of passengers per train mile increased from 50 to 60, a reduction of as much as 4,300,000 train miles, or 17 per cent., would be effected, and a very large saving in expenditure would result.

Thus, in view of the necessities of the case, the North-Western will in the course of the next few years probably effect a very considerable increase in its loading of both passenger and goods trains. Of course, the reduction in train mileage indicated may not occur in practice. What will probably take place is that a considerable reduction in train mileage will be effected in the period of trade depression upon which we have now entered, that when trade again revives great attention will continue to be paid to the loading of the trains, and that there will then be a much smaller increase in the train mileage than in the volume of traffic. In this way the train load will be built up to the figures indicated, and possibly to still larger figures. But whether the increase in train load is effected by

actually reducing the train mileage or by preventing an increase in train mileage when traffic grows is immaterial; the result will be the same, and the cost of working will be very greatly reduced. By the economies thus to be effected the Company will secure larger profits for its shareholders; it will be able to give a higher rate of remuneration to the smaller staff it will need in proportion to the traffic, and it will be able to reduce the charges for moving traffic in large waggon loads. To show the total saving in train mileage, even with the existing traffic, which will be effected when the Company increases its passenger load from 50 to 60 persons per train, and its freight load from 69 to $103\frac{1}{2}$ tons, we give the following:—

Existing and Possible Train Loads

Train mileage	Existing		Possible	
	Loads	Train mileage	Loads	Train mileage
Passengers (No.) . .	50	26,407,000	60	22,093,000
Freight (tons) . .	69	21,977,000	$103\frac{1}{2}$	14,652,000
Total . .	—	48,384,000	—	36,745,000

The train mileage may thus be reduced by about 25 per cent.—from over 48 million to under 37 million train miles. This increase in train load must necessarily be a gradual one. Nevertheless, the results of the years in which the reduction in train mileage is being effected will benefit.

Of course, the effect of the movement may, during the current period of depression, be partly neutralised by the decline in the gross earnings. But it must be remembered that beyond the savings which may be effected by the more economical methods of working, the Company will benefit greatly from the fall in prices of fuel and materials. The two movements combined should therefore give the railway a considerably larger profit from smaller gross earnings than secured in the year to June 30 last. To show how extremely heavy was the cost of working in the twelve months to June 30 last, in contrast both with 1899-1900 and with 1896, we set out below the sums paid for wages, material, coal, and other purposes, the total expenses, the total gross earnings, and the ratio of expenses to gross earnings in the years mentioned:—

Expenditure on Wages, Material, Coal, &c.

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
Wages . . .	3,745,800	3,757,000	3,148,000	597,000	18·96
Material . . .	983,000	907,000	694,000	289,000	41·64
Locomotive coal	978,000	643,000	393,000	585,000	148·85
Other . . .	3,105,000	2,952,000	2,518,000	597,000	23·71
Total expenses .	8,811,000	8,259,000	6,753,000	2,068,000	30·62
Gross earnings .	13,812,000	13,770,000	12,319,000	1,493,000	12·12
Ratio . . .	(63·79)	(59·97)	(54·81)	(8·98)	—

Thus an increase of 12 per cent. in the gross earnings was attended by an addition of nearly 42 per cent. to the cost of materials, by an increase of no less than 149 per cent. in the cost of coal, and of 24 per cent. in other expenses, largely affected by the rise in prices. The total increase in expenses reached nearly 31 per cent., in place of an increase of 12 per cent., which would have been the addition had wages and prices not risen.

That the importance of the foregoing comparison may be the better appreciated we set out below the results which would have been secured for the twelve months to June 30, 1901, had prices of material and coal been the same last year as they were in 1896 :—

—	1900-1 at 1896 Prices	1896	Increase
	£	£	%
Gross earnings	13,812,000	12,319,000	12·12
Expenditure—			
Wages	3,745,000	3,148,000	18·96
Material	778,000	694,000	12·12
Coal	440,000	393,000	12·12
Other	2,823,000	2,518,000	12·12
Total expenses	7,786,000	6,753,000	15·29
Ratio to gross earnings .	56·37 %	54·81 %	—
Net earnings	6,026,000	5,566,000	8·26

As the rise in wages has been brought about by conditions which are likely to continue, it would be

useless to calculate what the expenditure on wages would have been at the 1896 level. Any future saving in wages can only be secured by improved methods of working. We can now ascertain what may be the reduction in expenses when prices of coal and material fall back again to the 1896 level—a movement which is now rapidly progressing. The result of our calculations is set out below :—

—	1900-1 at 1896 prices	Actual, 1900-1	Increase or Decrease
	£	£	£
Gross earnings	13,812,000	13,812,000	—
Expenses—			
Wages	3,745,000	3,745,000	—
Material	778,000	983,000	— 205,000
Locomotive coal . .	440,000	978,000	— 538,000
Other expenses . . .	2,823,000	3,105,000	— 282,000
Total expenses . . .	7,786,000	8,811,000	— 1,025,000
Net earnings	6,026,000	5,001,000	+ 1,025,000

Thus, had the North-Western in the twelve months to June 30, 1901, been able to buy its coal, material, &c., at the prices current in 1896, its expenses would have been 1,025,000*l.* less than they were, and its net earnings would have been greater by a similar sum. That is to say, if the Company's gross earnings were to decline in the next two years by over a million, there would probably be no shrinkage in the net

L

earnings, as the fall in prices, and consequent reduction in expenditure, would neutralise any such decline. Although the outlook is unpleasant, it seems improbable that the depression in trade will go far enough to cause a shrinkage of something like 1,000,000*l.*, or over 7 per cent., in the North-Western's gross earnings. We may take it, therefore, that the combined effect of the economies from reduced train mileage, and of the saving arising from the fall in prices, will prevent the net earnings, even with very heavy shrinkage in gross receipts, from again falling to the level of those secured for the twelve months to June 30 last, and when trade improves the new methods of working are likely to bring the Company much larger profits than it has hitherto secured. Of course, it has to be borne in mind that the Company's outlays are constant, and that the economies in working, with the fall in prices, will not only have to make good the possible shrinkage in gross earnings, but also provide the addition to capital charges. We believe, however, that increased profits will be secured after meeting the additional charges.

In the foregoing we have dealt with the earnings of the Company; it is now necessary to refer to its capital charges and dividends. To show to what level the dividend for the twelve months to June 30 declined, as compared with the previous year and with 1896, we set out below the earnings, charges,

profits, and dividends for the two years to June 30, 1901 and 1900, and for 1896 :—

—	1900-1901	1899-1900	1896
Miles of road	1,936 $\frac{1}{2}$	1,923 $\frac{7}{8}$	1,908 $\frac{5}{8}$
	£	£	£
Gross earnings	13,812,000	13,770,000	12,319,000
Expenses	8,811,000	8,259,000	6,753,000
Ratio	(63·79)	(59·97)	(54·81)
Net earnings	5,001,000	5,511,000	5,566,000
Miscellaneous income .	179,000	195,000	183,000
Net income	5,180,000	5,706,000	5,749,000
Interest on Debenture stock	1,081,000	1,070,000	1,061,000
Rentals	218,000	199,000	202,000
General interest . . .	40,000	24,000	26,000
Total charges	1,339,000	1,293,000	1,289,000
Profit	3,841,000	4,413,000	4,460,000
Dividend on Guaranteed and Preference stocks .	1,527,000	1,527,000	1,527,000
Profit for Ordinary . .	2,314,000	2,886,000	2,933,000
Dividend	2,353,000	2,906,000	2,900,000
	(5 $\frac{1}{2}$ %)	(6 $\frac{1}{8}$ %)	(7 $\frac{1}{8}$ %)
Balance	Dr. 39,000	Dr. 20,000	Cr. 33,000
Brought forward . . .	72,000	94,000	67,000
Carried forward . . .	33,000	74,000	100,000
Capital expended . . .	112,172,000	110,722,000	106,452,000
Ordinary stock	42,782,000	42,269,000	40,701,000

To supplement the above, and to indicate the Company's dividend record, we set out on p. 164 the dividends paid for each calendar year since 1873, and for the twelve months to June 1901.

Year	Per cent.	Year	Per cent.	Year	Per cent.
1900-1	$5\frac{1}{2}$	1891	7	1881	$7\frac{1}{4}$
1900	$6\frac{1}{4}$	1890	$7\frac{1}{4}$	1880	$7\frac{3}{8}$
1899	$7\frac{1}{8}$	1889	$7\frac{3}{8}$	1879	$6\frac{1}{2}$
1898	$7\frac{1}{8}$	1888	$6\frac{3}{4}$	1878	$6\frac{1}{2}$
1897	$7\frac{1}{8}$	1887	$6\frac{1}{2}$	1877	$6\frac{5}{8}$
1896	$7\frac{1}{8}$	1886	$6\frac{1}{4}$	1876	$6\frac{5}{8}$
1895	$6\frac{3}{8}$	1885	$6\frac{1}{2}$	1875	$6\frac{3}{4}$
1894	$6\frac{1}{4}$	1884	$6\frac{3}{4}$	1874	$6\frac{1}{8}$
1893	$5\frac{3}{8}$	1883	$7\frac{1}{2}$	1873	$7\frac{1}{2}$
1892	$6\frac{1}{2}$	1882	$7\frac{1}{2}$		

We set out below the amount of and prices for the Company's securities, together with the yields afforded :—

—	Amount	Dividends	Prices	Yield
	£	%	Feb. 5	£ s. d.
3 % Debuture stock .	38,227,884	3	$103\frac{1}{2}$	2 18 0
4 % Guaranteed stock .	15,100,406	4	$134\frac{1}{2}$	3 0 5
4 % Preference stock .	23,080,620	4	$132\frac{1}{2}$	3 1 4
Consolidated stock .	42,871,199	$5\frac{1}{2}$	170	3 5 11
Total capital .	121,559,257	—	—	—

CHAPTER XVIII

THE LONDON AND NORTH-WESTERN—II

IN the last chapter we dealt at length with the position of this Company, and expressed the opinion that important economies in the cost of working would be effected by the improvement in train loads, but we did not refer to all the improvements to the system that are being made with the object of effecting economies and reducing train mileage. We would now indicate the other improvements that have been and are being made for the purpose of loading cars and trains more heavily and of facilitating the movement of traffic.

One of the most important of these has been that made at Crewe, which consists of the concentration of the whole of the goods traffic working, formerly done at various sidings in the neighbourhood, and at other adjacent stations, to one large shunting yard, where some 25 miles of additional sidings have been laid down, with the idea of economising shunting power, &c., marshalling the

trains more satisfactorily, saving time, and reducing train mileage.

A large transhipment shed has been erected, with a view to the loading of several small consignments in one truck, whereas in the past each small consignment has frequently been sent through to its destination in a truck by itself. This closer attention to the loading of small consignments means the saving of a large amount of car mileage. The reader will, of course, appreciate that Crewe is exceptionally well situated as a transhipment centre.

The most modern ideas in regard to the laying out of the shunting yards have been adopted, both in respect to signalling, lighting (electric), permanent way and gravitation. The signals and points are worked by electricity, thereby avoiding the great amount of physical labour necessary to set the old form of signals and points. This, of course, enables the work to be done by fewer signalmen. The lighting of the signals is under the control of the signalman, who has merely to switch on and off the light as required from his own cabin. Thus a considerable amount of labour is saved as compared with the old method of fixing and attending to oil and gas lamps.

Further, very great improvements have been made at Crewe Junction for removing the congestion and loss of time through the concentration of so

many passenger and goods trains at that centre. The Junction consists of six converging lines, two of which are of four lines of rails. This junction has been improved in regard to the working of the goods and mineral trains by the construction of tunnels underneath the passenger junctions, which enable goods trains to pass through Crewe quite independently of the passenger-train services.

The goods and coal yards at Willesden are to be enlarged in order to better concentrate the traffic from the various London depôts and avoid unnecessary trains, as well as to provide for the better distribution and stabling of the Company's vast London coal business.

At Euston important improvements are to be effected with the object of saving passenger-train mileage. In the past the empty trains have had to be sent back from Euston to Willesden Junction, a distance of five miles. Now sheds and sidings are being provided at Euston for stabling the empty carriages, &c.

Other work now in hand or recently completed consists of the widening of the Trent Valley line between Stafford and Nuneaton; of the construction of the Heaton Lodge and Wortley Railway to act as a relief to the line *via* Batley, which was very congested; of the widening of a considerable portion of the line between Chester and Holyhead, together

with the bridge over the Dee at Chester, and of the line through Preston, including the large span over the Ribble.

When all these improvements are completed it should be possible for the Company to work its slow as well as its fast train service more effectively and economically, and goods trains will have to be shunted much less frequently to permit of the passage of the faster passenger trains—an important matter with heavy loads.

We have already referred to the building of locomotives of greater capacity, and to the fact that this will enable much heavier trains to be worked with no greater expenditure for fuel, wages, or materials than is involved in the working of light trains.

CHAPTER XIX

THE MIDLAND RAILWAY

THIS Company holds the second place among the railways of this country, its receipts being exceeded by the London and North-Western alone. In a little over 30 years it has extended its system to London, and has pushed its lines into almost every corner of England. Its system now extends from London through the coal and manufacturing districts of the Midlands, Lancashire, and Yorkshire, to Carlisle, with extensions and joint lines from Derby through Birmingham to Gloucester, Bristol, Bath and Bournemouth on the south and to Swansea in the west, and from Nottingham and Leicester to Cromer and Yarmouth on the east. Its operations affect a vast number of other companies, with which it works in competition or in co-operation. In the past it has not hesitated to adopt its own line of policy. Thus, although the London and North-Western, and the Great Northern, and other lines with which it competes, continue to carry second-class passengers, the Midland has held to the determination to which

it came in 1874 to have only two classes of passengers. Another departure of the Midland has been the purchase of a very large number of traders' waggons, and in proportion to its traffic it still owns a greater amount of trucks than either of its neighbours, with the exception of the North-Eastern. Since it took over the traders' waggons it has permitted others to be built, and there are now as many traders' waggons on the Midland as there were before the purchase. Although the Company's passenger and goods traffic is much smaller than that of the London and North-Western, its coal traffic is the largest of any Company in the Kingdom, with the exception of the North-Eastern: the quantity of coal and coke, excepting gas coke, conveyed in 1900 amounted to 23,787,000 tons, as against the 18,724,000 of the North-Western. The North-Eastern's coal tonnage amounted to 34,349,000 tons. But the North-Eastern has a much shorter haul than the Midland, and, gauged by the ton mileage, the Midland's mineral coal traffic is greater than the North-Eastern's. The question of introducing larger waggons, especially for the transport of minerals, is consequently a very important matter for the Company. It is generally admitted that larger waggons are specially applicable to the carriage of coal, and inasmuch as the coal ton mileage of this Company is greater than that of any other line, it

follows that the introduction of larger coal waggons would enable it to reduce expenditure to a very great extent. In view of these conditions the Company has recently appointed Mr. John Mathieson as general manager, a gentleman who has had considerable experience with larger waggons in the Colonies, and is alive to the advantages to result from working the traffic in larger car and train loads. As the question of management is at the present time one of great importance, not only to the Midland, but to other companies, we would repeat the remarks of Sir Ernest Paget at the last half-yearly meeting with reference to Mr. Mathieson's appointment, and also as to the desire of the directors to adopt whatever new methods are considered to be advantageous. His remarks were as follows: 'At the present time we have sent two gentlemen to America to thoroughly study the methods there, more particularly, I am bound to say, in the locomotive department, and especially with regard to the use of electricity instead of steam or hydraulic power in our works. We have lately appointed a gentleman from Australia as manager, and I think very likely he will be able to bring some hints as to management.'

For various reasons the Company has hitherto made very little progress in increasing its train loads, but there can be no doubt that the matter is

engaging the careful consideration of the directors, the Chairman, and the new general manager. We anticipate, therefore, that the Company will effect considerable economies in the cost of working by building engines of greater capacity, and by loading its goods and passenger trains more heavily. This Company's total tonnage reaches 40,937,000 tons, of which about 24,000,000 tons, or 58 per cent., is coal and coke (excepting gas coke); some 9,000,000 tons, or 22 per cent., are, we estimate, of gas coke, iron ore, lime and limestone, and only some 8,000,000 tons, or 20 per cent., is merchandise. The bulk of the Company's traffic is, in fact, heavy traffic, capable of being economically handled. To show the quantity of the traffic carried by the Company in 1900, and the large percentage which coal and coke, exclusive of gas coke, represents to the total, we give the following:—

Freight Traffic in 1900

—	Tons	%
Minerals	32,750,000 ¹	80
Merchandise	8,187,000 ¹	20
Total freight	40,937,000	100

¹ These figures are partly estimated as the company does not return its tonnage of lime and limestone and iron ore as mineral traffic, but as general merchandise. Its coal traffic is officially given as 23,787,000 tons, and its total traffic as 40,937,000 tons.

During the past five years the Company's goods

traffic has very greatly increased. The expansion in its mineral earnings has reached $17\frac{1}{4}$ per cent., in its merchandise traffic nearly 14 per cent., and in its live stock receipts over $4\frac{1}{2}$ per cent. The total increase in its goods receipts has thus been as much as 15 per cent. We may point out that this increase has been secured in the period that the new Great Central line into London has been open.

To show how the Company's earnings from merchandise and minerals have increased in the past five years we give the following contrast:—

Revenue from Freight Traffic

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
Merchandise .	4,245,000	4,314,000	3,730,000	515,000	13·80
Live stock .	91,000	90,000	87,000	4,000	4·60
Minerals .	3,032,000	3,053,000	2,586,000	446,000	17·25
Total freight	7,368,000	7,457,000	6,403,000	965,000	15·07

The great increase in the earnings of the Midland in the past five years has in a large measure been due to the unprecedented activity and prosperity of the coal trade, which has benefited everyone connected with the industry. The outlook for the Midland coal trade is now much less promising than it has been for a considerable period, in view of the increasing competition both of foreign supplies

and of districts which lie closer to the seaboard and to cheap water transport. In the event of serious contraction in trade, which appears inevitable, the earnings of the Midland will be adversely affected. Consequently, it is most desirable in the interests of the Midland coal trade, as well as of its own prosperity, that the Company should handle its coal traffic with great economy, with a view to reducing rates and assisting the Midland coalowners to compete successfully with districts, both at home and abroad, more favourably situated as to cheap transport. The existing average train load of the Midland Company, in view of its large coal traffic, is surprisingly low. In 1896 the receipts from goods trains per train mile were only 63·72*d.*, and for the past year they were 65·69*d.*, an improvement in five years of 3 per cent. To show the loading of goods trains in the twelve months to June 30 last, in contrast with that of the twelve months to June 30, 1900, and with 1896, we set out the earnings and mileage of goods trains, and the receipts of goods trains per train mile :

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
Earnings of freight trains . . .	£7,368,000	£7,457,000	£6,403,000	£965,000	% 15·0
Mileage of freight trains. . .	26,913,000	27,270,000	24,111,000	2,802,000	11·6
Receipts of freight trains per mile .	65·69 <i>d.</i>	65·52 <i>d.</i>	63·72 <i>d.</i>	1·97 <i>d.</i>	3·1

Of course, an improvement of only 3 per cent. in the loading of goods trains, as indicated by the receipts of goods trains per mile, is in the right direction, and has enabled the Company to work more cheaply than if the mileage of the goods trains had increased in proportion to the growth in receipts. To show the total quantity of traffic moved we set out below the ton mileage from merchandise, on the basis of an average rate of $2d.$ per ton per mile, of live stock on the basis of $3\frac{1}{2}d.$ per ton per mile, and of minerals on the basis of $\cdot70d.$ per ton per mile—rates which may be regarded as approximately those secured.

Freight Receipts, Rates per Ton per Mile and Ton Mileage

Twelve months to June 30, 1901	Receipts	Rate per ton per mile	Ton miles
	£	d.	
Merchandise . .	4,244,439	2·00	509,332,680
Live stock . .	91,380	3·50	6,266,057
Minerals . . .	3,032,445	·70	1,039,695,428
Total freight .	7,368,264	1·137	1,555,294,165

Thus the Company's ton mileage is slightly larger than that of the North-Western, which has a larger amount of general merchandise traffic, paying a relatively high rate, and a smaller amount of mineral traffic. We have shown that the mileage of freight trains in the past year was 26,913,000, and we have shown also that the ton mileage was about 1,555

millions ; consequently the average train load of the Midland works out at only 57·8 tons, as against the North-Western's 69·1 tons. Consequently it would appear that the scope for increasing the train load of the Midland is even greater than that of the North-Western, with which we have already dealt. The experience of the new general manager in loading trains heavily and in handling large trucks should stand the Midland in good stead at a time when the energies of the managers of our railways, as well as of our manufacturers, require to be directed to reducing the cost of production of articles now made more cheaply in other countries. Below we set out the approximate ton and train mileage, the train load, the average rate per ton per mile, the earnings of freight trains, and the earnings per train mile in the twelve months to June 30 last :—

Freight Trains

Tons carried one mile	1,555,294,000
Train mileage	26,913,135
Train load	57·8 tons
Average rate per ton per mile	1·137d.
Earnings	£7,368,264
Earnings per train mile	65·7d.

To what extent the Company will be able to reduce its train mileage by increasing its train load will, of course, depend upon many circumstances, one of the principal being the attitude of neighbouring lines. We have already pointed out that the average

load is only about 58 tons. If the average mineral load is about 90 tons, a reasonable estimate, it would follow that the average load of merchandise and live stock traffic is only 34 tons. Such loads permit of great additions. In the last chapter we showed that if the North-Western's average train load were increased by 50 per cent., it would be raised from 69 to $103\frac{1}{2}$ tons. If the Midland's load were increased by 50 per cent., its average would still be only 87 tons, that is to say, its average load of merchandise and live stock would be 51 tons, and its average load of minerals would be 135 tons, as against the existing loads of 34 tons and 90 tons respectively. To give an approximate idea of the average loads of merchandise and minerals, as well as the total average loads of freight (including empty trains), we give the following :—

—	Tons carried one mile	Train miles	Average load
Merchandise and live stock	515,598,000	15,361,000	Tons 34
Minerals	1,039,695,000	11,552,000	90
Total freight	1,555,293,000	26,913,000	58

An increase in the average load by 50 per cent. from 58 to 87 tons would mean a reduction of no less than 9,000,000 train miles, or 33 per cent. And there is no reason against an even larger average train load being ultimately secured.

The Passenger Traffic

The Company's passenger traffic has during the past five years grown very rapidly, in spite of the increased competition. The earnings of the passenger trains in the twelve months to June 30 last were 3,540,000*l.*, as against 3,044,000*l.* in 1896, an improvement of 16·3 per cent. These additional receipts were, however, obtained by increasing the number of trains to a more than corresponding extent, the growth in passenger train mileage having been 16·7 per cent. Hence the receipts of passenger trains per mile has slightly fallen to 45·31*d.*, which compares with 45·48*d.* in 1896. Below we contrast the earnings and mileage of passenger trains with the receipts of passenger trains per mile in the past two years and in 1896 :—

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
Earnings of pas- senger trains	£3,540,000	£3,397,000	£3,044,000	+ £496,000	+ 16·3
Mileage of pas- senger trains	18,743,000	18,627,000	16,060,000	+ 2,683,000	+ 16·7
Receipts of pas- senger trains per mile	45·30 <i>d.</i>	43·75 <i>d.</i>	45·48 <i>d.</i>	— 0·18 <i>d.</i>	— 0·4

The improvement in earnings has been very marked in all branches of traffic other than the first

class passengers, which have improved by only 6 per cent. since 1896. The improvement in the third class receipts has been 17 per cent., in season tickets 19 per cent., in parcels, horses, &c., 15 per cent., and in mails 17 per cent.

To show the descriptions of passengers carried and the income received from parcels, horses, &c., and mails in the three years taken we give the following:—

Receipts of Passenger Trains

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
				£	%
First-class . . .	£ 226,000	£ 218,000	£ 213,000	13,000	6·10
Third-class . . .	2,352,000	2,256,000	2,004,000	348,000	17·36
Season . . .	231,000	222,000	194,000	37,000	19·07
Parcels, horses, &c.	663,000	634,000	575,000	88,000	15·30
Mails . . .	68,000	67,000	58,000	10,000	17·24
Total . . .	3,540,000	3,397,000	3,044,000	496,000	16·29

From the above it will be noted how extremely small are the first-class receipts in proportion to the third class. The actual number of first class passengers in proportion to the third class is of course much smaller still. To show the number of passengers carried and the passengers carried one mile, we give the following, basing the mileage on

the average rates of 1·7*d.* for first class, ·9*d.* for third, and ·31*d.* for season tickets :—

Number of Passengers, Receipts, Rate per Passenger, and Passenger Mileage

Year to June 30, 1901	Number of passengers	Receipts	Rate per passenger per mile	Number of passengers carried one mile
First class . . .	1,334,307	£ 226,343	<i>d</i> 1·70	31,954,000
Third class . . .	47,377,138	2,351,924	0·90	627,180,000
Season	142,765	231,449	0·31	179,184,000
Total	48,854,210	2,809,716	0·804	838,318,000

To show the passenger mileage of season tickets we give the following :—

Season-ticket, Receipts 1900

—	Receipts	Rate per passenger per mile	Passenger miles
First class . . .	£ 85,729	<i>d</i> ·42	48,986,000
Third class . . .	139,819	·27	124,320,000
Total	225,548	·31	173,306,000

Having thus obtained the mileage of ordinary passengers and of season-ticket holders, it is possible to ascertain the approximate number of passengers per train mile. We find that the number of first class ordinary passengers per train is only 1·7 and of third class 33·4, while the number of first class

season-ticket holders per train is only 2·7 and of third class 6·9. Thus the total average number of first class passengers per train is no more than 4·4, while the number of third class passengers amounts to 40·3. The total number of passengers per train is thus 44·7.

We set out the approximate number of first and third class passengers per train mile :—

Average Passenger Train Loads

Passengers per train	Ordinary Tickets	Season Tickets	Total
	No.	No.	No.
First class	1·7	2·7	4·4
Third class	33·4	6·9	40·3
Total	35·1	9·6	44·7

Beneath we summarise the results of the passenger-train working :—

Passenger Train Results

Passenger mileage	838,318,000
Train mileage	18,742,000
Number of passengers per train mile	44·7
Average fare per passenger per mile	·804d.
Passenger earnings	£2,810,000
" " per train mile	35·9d.
Total earnings of passenger trains	£3,540,000
" " per passenger train mile	44·7d.

Were it possible by one means or another to increase the passenger train load from under 45 per train to 55, it would effect a saving of 3,500,000

train miles. This saving in train mileage, added to that which would be effected by increasing the train load of goods from 58 to 87 tons, would effect a total reduction in train mileage of over 12,500,000 miles. That is to say, the total train mileage of the Company under existing conditions is 45,656,000, and under the new conditions it would be only 33,117,000.

To show the total saving in train mileage which would be effected were the Company to increase its passenger load from 45 to 55 per train, and its goods load from 58 to 87 tons, we give the following:—

Existing and Possible Train Loads.

Train mileage	Existing		Possible	
	Loads	Train mileage	Loads	Train mileage
Passengers (No.) . . .	44·7	18,743,000	55	15,241,000
Goods (tons) . . .	57·8	26,913,000	87	17,876,000
Total		45,656,000		33,117,000

Ultimately still larger average loads should be attained. The increased train loads indicated are likely to be brought about, first, by a considerable saving in the mileage of both passengers and of goods trains during the present depression in trade, and, secondly, by more careful attention to loading the trains when trade improves. The efforts to

work more economically by increasing the train loads should show some immediate effect upon the rate of working. The effect of the change in the methods of working should, however, be very pronounced as soon as trade improves, and a much larger quantity of traffic is carried with little or no addition to the train mileage.

The Company's expenditure during the period of trade depression will be greatly reduced by the fall in prices of coal and material. To show how great has been the increase in the expenditure in the past five years, especially from the rise in wages, we contrast below the outlays upon wages, material, locomotive coal, and other purchases in the twelve months to June 30, 1901, for the previous year and for 1896 :—

Expenditure on Wages, Material, Coal, &c.

—	1900-1	1899-1900	1896	Increase 1900-1901 compared with 1896	
				£	%
Wages . . .	£ 3,904,000	£ 3,844,000	£ 3,077,000	827,000	26·87
Material . . .	811,000	790,000	627,000	184,000	29·31
Locomotive coal .	786,000	630,000	356,000	430,000	120·79
Other . . .	1,508,000	1,425,000	1,223,000	285,000	23·30
Total expenses	7,009,000	6,689,000	5,283,000	1,726,000	32·67
Gross earnings .	11,052,000	10,994,000	9,553,000	1,499,000	15·69
Ratio . . .	(63·42)	(60·84)	(55·30)	(8·12)	(14·68)

The addition to wages since 1896 has been no less than 27 per cent., as against an increase of

under 16 per cent. in gross earnings. In this respect the Midland has suffered more seriously than the North-Western, whose increase in wages in the same period was 19 per cent. with an addition of over 12 per cent. to the gross earnings. Any reduction in the wages bill cannot, of course, be looked for except by means of more economical methods of working, which it may be hoped will be gradually introduced. A changed method of working is, indeed, as important to the men employed as to the shareholders, for the profits to result from more economical methods of working would enable the Company to pay a higher scale of wages to the smaller staff needed to deal with the traffic. The increase of 29 per cent. in the sums spent upon materials since 1896 does not correspond to the advance in prices which has occurred. The explanation for the comparatively small increase is that the Company in 1896 was spending money somewhat freely upon maintaining and improving its system. The Company has also been somewhat favoured with respect to its coal contracts. The increase in its locomotive coal bill since 1896 has been less than 121 per cent., with a growth in traffic of nearly 16 per cent., whereas the addition to the North-Western's locomotive coal bill was nearly 149 per cent., with a growth in traffic of a little over

12 per cent. It is essential to bear these considerations in mind, as, of course, those lines which have suffered least from the rise in prices will benefit least from the fall in prices. Nevertheless, the saving in the expenditure of the Midland by reason of the fall in prices will be very considerable. To show more clearly how much the Company has suffered from the rise in prices, and how much consequently it may gain in the corresponding fall in prices, we set out below the expenditure for the twelve months to June 30 last had the increased sums paid for material, coal and other expenses been no greater in proportion than the increase in the gross earnings since 1896 :—

—	1900-1 at 1896 prices	1896	Increase	
	£	£	£	%
Gross earnings . . .	11,057,000	9,553,000	1,499,000	15·7
Expenditure—				
Wages	3,904,000	3,077,000	827,000	26·9
Material	725,000	627,000	98,000	15·7
Coal for locomotives .	412,000	356,000	56,000	15·7
Other	1,415,000	1,223,000	192,000	15·7
Total expenses . . .	6,456,000	5,283,000	1,173,000	22·7
Ratio to gross earnings .	(58·41)	(55·30)	(3·11)	—
Net earnings	4,596,000	4,270,000	326,000	7·6

Having thus arrived at the approximate amount which the expenditure would have reached had

prices of material and coal not risen, we can now ascertain the approximate saving in expenditure which will be secured when prices fall back to the 1896 level. We set out the calculation below :—

—	1900-1 at 1896 prices	Actual 1900-1	Increase or Decrease	
	£	£	£	%
Gross earnings . . .	11,052,000	11,052,000	—	—
Expenses—				
Wages	3,904,000	3,904,000	—	—
Material	725,000	811,000	— 86,000	— 10·6
Locomotive coal . . .	412,000	786,000	— 374,000	— 47·5
Other expenses . . .	1,415,000	1,508,000	— 93,000	— 6·2
Total expenses . . .	6,456,000	7,009,000	— 553,000	— 7·9
Net earnings	4,596,000	4,043,000	+ 553,000	+ 13·6

The above calculation shows that had the Midland been able to buy its material and coal last year as cheaply as in 1896, its expenditure would have been 553,000*l.* less, and its net earnings would have been so much the greater. Indeed, had a similar quantity of material been used last year as in 1896, the reduction in expenditure would be still greater, and in place of a 10 per cent. reduction in the sum spent upon material by reason of the lower prices, there would be a reduction of nearly 20 per cent.

To show the effect upon the Company's profits of the very high expenditure of the past year in contrast,

with that of the previous year and with 1896, we give the following :—

—	1900-91	1899-1900	1896
Average mileage . . .	1,490 $\frac{1}{4}$ £	1,485 $\frac{1}{4}$ £	1,464 $\frac{1}{2}$ £
Gross earnings . . .	11,052,000	10,994,000	9,553,000
Expenses	7,009,000	6,689,000	5,283,000
Ratio	(63·42)	(60·84)	(55·30)
Net earnings . . .	4,043,000	4,305,000	4,270,000
Miscellaneous income .	229,000	252,000	208,000
Net income	4,272,000	4,557,000	4,478,000
Interest on debenture stock	902,000	884,000	848,000
Rentals	54,000	48,000	225,000
Total charges . . .	956,000	932,000	1,073,000
Profit	3,316,000	3,625,000	3,405,000
Dividend on guaranteed and preference stocks . .	1,605,000	1,563,000	1,332,000
Profit for ordinary . .	1,711,000	2,062,000	2,073,000
Dividend	1,721,000 (4 $\frac{5}{8}$ %)	2,061,000 (5 $\frac{5}{8}$ %)	2,071,000 (6%)
Balance	Dr. 10,000	Cr. 1,000	Cr. 2,000
Brought forward . .	21,000	21,000	38,000
Carried forward . . .	11,000	22,000	40,000
Capital expended . . .	105,558,000	102,944,000	96,008,000
Ordinary Stock . . .	37,210,000	36,640,000	34,500,000

The dividend paid for the twelve months to June 30, 1901, of 4 $\frac{5}{8}$ per cent. is the lowest, with the exception of 1893, when the great coal strike in the Midlands affected its dividends, since 1886, when a

similar rate was paid. Below we show the dividends paid by the Company since 1872 :—

	%		%		%
1900-1	$4\frac{5}{8}$	1891	$6\frac{3}{8}$	1881	$5\frac{7}{8}$
1900	$5\frac{1}{4}$	1890	$6\frac{1}{4}$	1880	$6\frac{1}{8}$
1899	$5\frac{7}{8}$	1889	6	1879	$5\frac{5}{8}$
1898	$5\frac{7}{8}$	1888	$5\frac{1}{4}$	1878	$5\frac{3}{8}$
1897	$5\frac{7}{8}$	1887	$4\frac{3}{4}$	1877	$5\frac{3}{8}$
1896	6	1886	$4\frac{3}{8}$	1876	$5\frac{3}{8}$
1895	$5\frac{1}{8}$	1885	$5\frac{1}{8}$	1875	6
1894	$5\frac{1}{4}$	1884	$5\frac{3}{8}$	1874	6
1893	$3\frac{7}{8}$	1883	$5\frac{7}{8}$	1873	$6\frac{5}{8}$
1892	6	1882	$5\frac{7}{8}$	1872	$7\frac{1}{4}$

Whether the Company's dividends will again fall to the low level of that reached during the twelve months to June 30, 1901, will depend upon the extent of the shrinkage in the gross earnings which may be witnessed as well as upon the savings above shown. That the Company's receipts will seriously suffer from the growing slackness of trade cannot be doubted. We have shown above that the fall in prices alone may reduce the Company's expenditure by 553,000/. Allowing, however, for a fall of 20 per cent. in the price of material, in place of the 10 per cent. shown above, the reduction would reach considerably over 600,000/. This means that, apart from the economies effected by improved methods of working, the Company could witness a decline of about 6 per cent. in its gross earnings before its net earnings would fall beneath the level of those for the past twelve months. We have, of course, to allow for a considerable

increase in capital charges, but it may be hoped that the economies, apart from the fall in prices of fuel and material, will materially assist in covering the interest upon the new capital raised for widenings and improvements.

Below we set out the amounts, prices, and yields of the Company's stocks:—

—	Amount	Dividend	Price Feb. 5, 1902	Yield
	£	%		£ s. d.
2½ % debenture stock .	36,371,338	2½	85	2 18 10
2½ % perp. guaranteed .	16,752,916	2½	83½	3 0 9
2½ % perp. preference .	47,967,949	2½	81	3 2 8
2½ % preferred ordinary .	37,274,855	2½	75	3 7 10
Deferred ordinary . .	37,359,977	2½*	67½	3 5 3
Total capital . .	175,727,035	—	—	—

* Dividend for twelve months to June 30, 1902.

The Company has duplicated its Ordinary stock, and has converted it into Preferred and Deferred. Thus 100% of the old undivided Ordinary is now represented by 100% of Two-and-a-Half per cent. Preferred Ordinary and 100% of Deferred.

CHAPTER XX

THE GREAT WESTERN RAILWAY

THIS Company's roadway of 2,636 miles is by far the longest in the kingdom, but as it serves fewer industrial centres and brings less coal into London than the London and North-Western and the Midland Companies, the density of its freight traffic is smaller. By reason of its length, as well as of its geographical position, its passenger earnings greatly exceed those of the Midland, but they fall considerably beneath those of the London and North-Western. The excellence of its road and rolling stock and the speed of its trains entitle it to the high position it holds in the estimation of the British travelling public.

The system serves both the west and the south-west of England. Its lines extend from London *via* Reading, south-west to Weymouth, Exeter, Plymouth, Falmouth, and Penzance, and they hold the monopoly of a large portion of Devonshire and Cornwall. Westward they stretch to Bath, Bristol, Gloucester,

and the important towns of South Wales as far as Milford and Fishguard; northwards they reach to Oxford, Birmingham, Wolverhampton, Shrewsbury, Birkenhead, and Manchester. Between Shrewsbury and Reading the Company has three main lines of railway serving the western counties of England. The Company secures a large share in the purely South Wales coal and mineral traffic, as well as in the heavy goods traffic flowing to and from the Staffordshire and Warwickshire districts. To show the extent of its coal, coke, and other mineral traffic and the quantity of its general merchandise, we give the amounts for 1900 :—

—	Tons	% of total
Coal and coke . . .	16,405,471	44
Other minerals . . .	13,671,315	36
Total minerals . . .	30,076,786	80
Merchandise . . .	7,423,724	20
Total freight . . .	37,500,510	100

In view of its large share in the South Wales coal trade, the attitude of the Great Western towards the question of larger train and car loads is of great importance, for should it adopt more economical methods of working, neighbouring lines would be compelled to act in a similar manner, and very great savings would result both to itself and to its neighbours.

Its progressive policy of recent years indicates that it will not long delay to introduce improved methods of working when it is convinced of the benefits to result. At the present time it is greatly improving its system, with a view, first, to securing additional traffic by shortening both the time and distance between London and the whole of its western and south-western districts; and, secondly, to relieving the congestion of traffic on certain portions of its line.

It is building an important cut-off between Wootton Bassett and Patchway, whereby the distance to South Wales and to Ireland will be greatly reduced, and the congestion on the existing line through Bath and Bristol will be relieved. It is also constructing a connection between Castle Cary and Longport, which will give it an alternative route to Devonshire and Cornwall to that *via* Swindon and Bristol, thus affording great relief to the latter line. Further, jointly with the Great Central, it is building a line from Neasden to High Wycombe and from Princes Risborough to Grendon Underwood, affording, with its existing line from High Wycombe to Princes Risborough, an alternative route to the Metropolitan's line of heavy grades and curves. By means of this line, as well as by its connection at Banbury, the Great Western evidently expects to exchange a considerable amount of traffic for the

Midland and Northern districts served by the Great Central.

We may further note that when the South Wales and Bristol direct railway from Wootton Bassett to Patchway is completed, the Company's route to Queenstown will be something like 100 miles shorter than that of the London and North-Western, and that with this great difference in its favour it may secure a larger proportion of the passenger and mail traffic from the southern half of England to the south of Ireland. The proposal to run a line of passenger steamers from Berehaven to the States in an incredibly short number of days cannot of course be seriously considered; but should such a plan ever be carried out the Great Western would have a fair chance of securing the lion's share of the traffic. Thus the Company is exerting itself both to improve its geographical position by the construction of cut-offs, to relieve the congestion of its traffic at various points by the provision of alternate routes, and is losing no opportunity of developing traffic by means of new connections. This policy has necessarily involved large capital outlays. At the end of June last the lines in course of construction not yet opened to traffic had cost 1,727,000*l.*, and they will cost a great deal more before they are finished. That the cost of material and fuel should have increased so rapidly and unexpectedly at the moment that the

N

Company was engaged in this improvement policy was very unfortunate. And the dividend paid for the twelve months to June 30 last of only 4 per cent. was a smaller distribution than had previously been earned since 1878, with the exception of 1898, when the great coal strike in South Wales occurred.

With high capital charges and declining trade the Company has special cause for putting forth every effort to effect economies. In the June half of 1901 an appreciable reduction in train mileage was effected, the receipts per passenger train mile increased by nearly 4 per cent., and the receipts per goods and mineral train mile by over 3 per cent.

THE FREIGHT TRAFFIC

In spite of the saving in freight train mileage in the past half-year the receipts per freight train mile in the twelve months to June 30, 1901, were less than 1 per cent. greater than in 1896. To show how small has been the increase in the train load in the past year compared with 1896, in spite of the very large addition to the traffic, we contrast on the next page the earnings and mileage of freight trains and the receipts of freight trains per mile in the past years ended June 30, 1901 and 1900, and the calendar year 1896.

—	1900-1	1899-1900	1896	Increase 1900-1 com- pared with 1896	
					%
Earnings of freight trains	£5,694,000	£5,719,000	£5,023,000	£671,000	13·3
Mileage of freight trains	22,598,000	23,096,000	20,094,000	2,504,000	12·5
Receipts of freight trains per mile . .	60·45d.	59·42d.	59·97d.	0·48d.	0·8

The expansion shown above of 13·3 per cent. in freight receipts has been fairly evenly divided between merchandise and mineral receipts, as will be seen from the following contrast of the receipts from merchandise, live stock, and minerals for the twelve months to June 30, 1901 and 1900, and for 1896:—

Revenue from Freight Traffic

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
					%
Merchandise .	£ 2,778,000	£ 2,755,000	£ 2,433,000	£ 345,090	14·18
Live stock .	142,000	145,000	141,000	1,000	0·71
Minerals . .	2,774,000	2,819,000	2,449,000	325,000	13·27
Total . .	5,694,000	5,719,000	5,023,000	671,000	13·35

As this Company does not compile ton mileage figures we have been compelled to estimate them. After inquiry we have come to the conclusion that its rates average 2d. per ton per mile for merchandise, 3½d. per ton per mile for live stock, and ·7d. per ton

per mile for minerals, or about the same averages as estimated for the London and North-Western and the Midland Companies. On this basis the Company's ton mileages of merchandise, live stock, and minerals, and of its total freight are as follows :—

Freight Receipts, Rates per Ton per Mile and Ton Mileage

Twelve months to June 30, 1901	Receipts	Rate per ton per mile	Ton miles
	£	d.	
Merchandise	2,778,621	2·0	333,434,000
Live stock	141,743	3·5	9,719,000
Minerals	2,774,022	·7	951,091,000
Total freight	5,694,386	1·056	1,294,244,000

The freight train mileage for the twelve months to June 30 last was 22,598,000, and if we divide this into the tons carried one mile of 1,294,000,000, we arrive at an average train load of only 57·2 tons. This compares with 57·8 tons of the Midland, and 69·1 tons of the London and North-Western. Were it not that the Company has a larger proportion of mineral traffic to its total freight traffic, its freight train load would be considerably less than that of the Midland. Measuring merchandise trains with merchandise, and minerals with minerals, the average load of the Great Western appears to be nearly 10 tons per train less than the Midland, and nearly 20 tons per train less than the North-Western.

Below we set out the approximate ton and train mileage, the train load, the average rate per ton per mile, the earnings of freight trains, and the earnings per freight train mile in the twelve months to June 30 last:—

Freight Trains

Tons carried one mile	1,294,244,000
Train mileage	22,597,915
Train load	57·2 tons
Average freight rate per ton per mile	1·056 <i>d</i> .
Freight earnings	£5,694,386
Earnings per freight train mile	60·4 <i>d</i> .

We have shown above that the average load of freight trains is only 57·2 tons. If the average mineral train load be calculated at 80 tons, as against 90 tons of the Midland and 100 tons of the North-Western, it follows that the average merchandise and live stock train loads of the Great Western is only 32 tons, as against the Midland's 40 tons and the North-Western's 45 tons.

To give an approximate idea of the average loads of merchandise and minerals, as well as the total average loads of goods (including empty trains), we give the following:—

—	Tons carried one mile	Train miles	Average load
Merchandise and live stock	343,153,000	10,709,000	Tons 32
Minerals	951,091,000	11,888,000	80
Total freight	1,294,244,000	22,597,000	57

Although due allowance must be made for the very large mileage which passes through agricultural and other districts where the density of traffic is low, yet an average load of merchandise trains of only 32 tons seems to be capable of improvement. Surely it would be possible to hold traffic a little longer than is now done in agricultural districts in order that more paying loads may be secured. Is not an improvement in the estimated average merchandise train load from 32 to 48 tons quite capable of attainment? Further, when more powerful locomotives are built, a considerable improvement in the average mineral load should also be attained. The Company is now building locomotives of greater capacity. An improvement in the average mineral train load from 80 to 120 tons would of course mean a very large reduction in the train mileage. An increase in the average freight train load from 57 to 86 tons would mean a reduction of as many as 6,700,000 train miles.

THE PASSENGER TRAFFIC

The growth in the passenger earnings of the Company during the past few years has been exceedingly large. In 1896 the total passenger receipts were 4,418,000*l.*, and for the twelve months to June 30 last they reached 5,315,000*l.*—an expansion in four years and six months of no less than 897,000*l.*, or

20·3 per cent. In some slight degree this increase is due to the average mileage for the past year having been 2,636 as against 2,524—an increase of 112 miles, or a little over 4 per cent. But allowing for the additional mileage, the growth in the passenger receipts in the period would still be about 16 per cent., and it is unlikely that the new mileage has given receipts up to the average of the rest of the system. Attending the increase of over 20 per cent. in the earnings from passenger trains there has been an increase of nearly 12 per cent. in the mileage of passenger trains, and the receipts per passenger-train mile have increased by 7·3 per cent., having been 54·55*d.* in the twelve months to June 30 last, as against 50·83*d.* in 1896.

Below we contrast the earnings and mileage of passenger trains with the receipts of passenger trains per mile in the past two years and in 1896 :—

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
					%
Earnings of passenger trains	£5,315,000	£5,087,000	£4,418,000	£897,000	20·3
Mileage of passenger trains	23,382,000	23,323,000	20,854,000	2,528,000	12·1
Receipts of passenger trains per mile . .	54·55 <i>d.</i>	52·34 <i>d.</i>	50·83 <i>d.</i>	3·72 <i>d.</i>	7·3

By whatever method the Company has increased its receipts of passenger trains per mile by 7 per cent., the result is satisfactory. We would point

out that this result has been obtained by offering greater inducements to passengers to travel second class, and in thus filling more fully carriages which previously were almost empty. In 1896 the earnings from second class traffic were only 332,000*l.*, but for the twelve months to June 30 last they reached 622,000*l.*, an improvement of no less than 290,000*l.*, or 87·35 per cent. Further, the Company has succeeded in attracting a larger number of passengers into its first class carriages, the receipts from first class in the past year having been 307,000*l.* as against 259,000*l.* in 1896, an improvement of 48,000*l.*, or 18·53 per cent. In consequence of these large additions to the first and second class passengers the improvement in third class earnings was only 346,000*l.*, or 12·07 per cent.

Thus the policy of endeavouring to fill the first and second class carriages has been attended with marked success. The improvement in the receipts from season tickets in the period has been over 21 per cent., and in parcels, horses, &c., over 26 per cent. The increase in mails of only 3,000*l.*, or a little over 2 per cent., is surprisingly small. But if the Company were to succeed in securing a larger share of the mail and other traffic between the southern portion of England and the south of Ireland by the proposed new route *via* Fishguard and Rosslare, the earnings from mails might show marked

expansion. To show the very large expansion in the various descriptions of passenger and other receipts carried in passenger trains since 1896 we give the following contrast:—

Receipts of Passenger Trains

—	1900-1	1899-1900	1896	Increase 1901 compared with 1896	
	£	£	£	£	%
First class .	307,000	291,000	259,000	48,000	18·53
Second class .	622,000	570,000	332,000	290,000	87·35
Third class .	3,213,000	3,105,000	2,867,000	346,000	12·07
Season .	166,000	162,000	137,000	29,000	21·17
Parcels, horses, &c. .	873,000	827,000	692,000	181,000	26·15
Mails .	134,000	132,000	131,000	3,000	2·29
Total .	5,315,000	5,087,000	4,418,000	897,000	20·30

To ascertain the loading of passenger trains it is, of course, first necessary to arrive at the approximate number of passengers carried one mile. After careful calculation, we have arrived at the conclusion that the Great Western's charges per passenger per mile for first, second, and third class passengers are much the same as those we estimated for the London and North-Western and the Midland—that is to say, about 1·7*d.* for first class, 1·1*d.* for second class, and ·9*d.* for third class. The season-ticket rates, however, are higher, inasmuch as the line serves districts out of London which have special attrac-

tions. We estimate the average rate for season tickets consequently at $\cdot44d.$ per passenger per mile, as against $\cdot35d.$ estimated for the North-Western and $\cdot31d.$ for the Midland. On this basis the average rate per passenger per mile works out at $\cdot919d.$ We show below the number of passengers carried, the receipts, the rate per passenger per mile, and the number of passengers carried one mile in the twelve months to June 30, 1901 :—

Number of Passengers, Receipts, Rate per Passenger, and Passenger Mileage

Year to June 30, 1901	Number of passengers	Receipts	Rate per passenger per mile	Number of passengers carried one mile
		£	d.	
First class . .	1,422,000	306,889	1·70	43,325,000
Second class . .	6,139,000	622,099	1·10	134,458,000
Third class . .	72,580,000	3,212,944	0·90	856,785,000
Season . .	48,000	166,211	0·44	90,660,000
Total . .	80,189,000	4,308,143	0·919	1,125,228,000

We should also explain that the relatively high average rate for season tickets, as compared with the North-Western and Midland Companies, is in part due to the very small number of third class passengers carried, as compared with the other two lines. The average season-ticket fare per mile for first class passengers we calculate as $\cdot53d.$, for second class

·40*d.*, and for third class passengers ·34*d.* We thus arrive at the passenger miles of first, second, and third class season-ticket holders :—

Season Ticket Receipts, 1900

—	—	—	Passenger miles
	£	<i>d.</i>	
First class	66,211	·53	29,976,000
Second class	84,877	·40	50,926,000
Third class	11,897	·34	8,397,000
Total	162,985	·44	89,299,000

Although the Company has considerably improved its receipts from first and second class passengers in the last few years, the number of these passengers carried per train is still very low. The number of first class passengers travelling by ordinary ticket per train in the twelve months to June 30 last was 1·85, and, including the number travelling by season ticket, the total is only 3·16. We would again point out that the season-ticket holders travel in a relatively few trains, that these are heavily loaded, and that the Company derives considerable profit by reason of these heavy loads. The number of second class passengers travelling by ordinary ticket is 5·74, and by season ticket 2·21—a total of 7·95 ; while the number of third class passengers per train travelling by ordinary ticket is 36·61, and by season ticket

only 0·37—a total of 36·98 per train. The total number of passengers per ordinary ticket is thus 44·20, and by season ticket 3·89, making a total of 48·09.

Below we set out the approximate number of first, second, and third class passengers per train mile:—

Average Passenger Train Loads

Passengers per train	Ordinary tickets	Season tickets	Total
	No.	No.	No.
First class . .	1·85	1·31	3·16
Second class . .	5·74	2·21	7·95
Third class . .	36·61	·37	36·98
Total . .	44·20	3·89	48·09

The reader will recollect that the North-Western's average passenger load was 49·9 and that of the Midland 44·7. The Great Western's thus comes very close to the North-Western's passenger load. Indeed, if we take the ordinary tickets only, which is the best criterion of whether a superfluity of trains are or are not run, we find that the Great-Western carries 44·2 passengers, as against the 41·4 of the North-Western and the 35·1 of the Midland. Such comparisons are of some, though not of much value, as each line works under varying conditions both as to competition and as to the class of passenger carried. But

there is little doubt that all three companies can materially increase their average passenger train load by discontinuing the trains which are shown to be unnecessary from the very small number of passengers which travel by them.

Were the average passenger train load increased from 48 to 58 passengers per train, the train mileage would be reduced from 23,382,000 to 19,400,000—a saving of nearly 4,000,000 train miles.

Below we summarise the results of the passenger train working:—

Passenger Train Results

Passenger mileage	1,125,228,000
Train mileage	23,382,083
Number of passengers per train mile	48·1
Average rate per passenger per mile	·919 <i>d.</i>
Passenger earnings	£4,308,143
" " per train mile	44·2 <i>d.</i>
Total earnings of passenger trains	£5,315,255
" " per passenger train mile	54·55 <i>d.</i>

That a considerable reduction in both passenger and freight train mileage will be effected during a period of trade depression cannot be doubted, and it appears certain that by devoting greater attention to loading more heavily when trade improves the Company will attain to the loads we indicate. The principle that increased density of traffic should mean increased loading, and that additional trains either for passengers or freight should only be put on after very careful consideration and by experi-

ments to prove that they are needed will, we are sure, be generally accepted. But in the past an enormous growth in the density of traffic of British railways—we do not specially refer to the Great Western—has been attended by a corresponding increase in the train mileage, and by no perceptible increase in the train load. The measures that are now being taken to provide engines of greater capacity and by the building of larger trucks will bring a large increase in the average freight train load at no very distant date. Further, passenger loads in course of time may be raised to the figures we mention, if the necessary effort and discrimination is exercised; but the operation will necessarily be much slower than with freight, and is likely to be brought about more by the growth of traffic than by cutting down the number of trains now running. At the present time the total train mileage of the Great Western is 45,980,000. If the number of passengers carried per train were increased from 48 to 58, and the quantity of goods per train from 57 to 85 tons, the train mileage would be only 34,626,000, or a saving of 11,350,000 miles.

To show the total saving in train mileage which would be effected were the Company with its existing traffic to increase its passenger load from 48 to 58 per train, and its freight load from 57 to 85 tons, we give the following:—

Train Mileage	Existing		Possible	
	Loads	Train mileage	Loads	Train mileage
Passengers (No.) . . .	48	23,382,000	58	19,400,000
Goods (tons) . . .	57	22,598,000	85	15,226,000
Total		45,980,000		34,626,000

Ultimately a still heavier train load should be secured.

THE REDUCTION IN EXPENDITURE

How much the reduction in train mileage will be during the next year or two cannot, of course, be predicted. But that it will be considerable is undoubted. The effort of the Great Western to reduce train mileage in the first half of 1901 was attended with much success, and in the past half-year a further marked reduction has doubtless been effected. And beyond the savings it will secure by reducing train mileage the Company will, of course, benefit from the much lower prices of coal and material now current than last year. On the other hand, however, it may suffer to some extent from a loss in gross earnings as a result of the depression in trade. Up to the present its gross earnings have fortunately shown marked expansion. In view of the high quality and great demand for South Wales coal the depression in that industry may be less marked than in the Midland coal trade. But those engaged in

the trade will have a greatly reduced spending capacity after the fall in prices, in wages, and in profits has occurred. Further, in view of the losses suffered by the general community owing to the continuance of the war and the slackness of business, the quantity of passenger and of other traffic may for a time tend to diminish. We believe, however, that the contraction will not be so severe as to cause the Company's gross earnings to decline to such an extent that the loss cannot be neutralised by the reduction in expenses arising from curtailed train mileage and from the fall in prices of fuel and materials. To give an idea of the effect upon the Company's expenditure, of the increase in wages, and the higher prices paid for material, coal, &c., we contrast the expenditure for these purposes for the twelve months to June 30, 1901, and

Expenditure on Wages, Material, Coal, &c.

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
Wages . . .	2,816,000	2,785,000	2,362,000	454,000	19·22
Material . . .	984,000	953,000	664,000	320,000	48·19
Locomotive coal .	886,000	585,000	344,000	542,000	157·55
Other . . .	2,446,000	2,295,000	1,931,000	515,000	26·67
Total expenses	7,132,000	6,618,000	5,301,000	1,831,000	34·54
Gross earnings	11,181,000	10,973,000	9,608,000	1,573,000	16·37
Ratio . . .	(63·78)	(60·31)	(55·17)	(8·61)	—

1900, and for 1896, together with the total expenses, the gross earnings, and the ratio of expenses to gross earnings.

Thus an increase of a little over 16 per cent. in gross earnings, and, as we have previously shown, of a somewhat smaller percentage in the increase in train mileage, have been attended by an addition of 19·22 per cent. to the wages, by an increase of no less than 48·19 per cent. in material, by an addition of as much as $157\frac{1}{2}$ per cent. to the sums paid for coal, and by an expansion of 26·67 per cent. in other expenditure. The increase in wages must, of course, be disregarded, as no change from the present conditions of labour are to be looked for. But it may be reasonably expected that, in view of the better conditions and higher wages paid, the men should be taught to work more scientifically and efficiently for the good of themselves, of the railway, and of the public.

The very large increase of 48 per cent. in the sum spent upon material has been due to the Company having continued to spend money very liberally upon maintenance of way and equipment, and to its expenditure having thus borne the full effect of the high prices. To show what would have been the increase in expenses in the twelve months to June 30 last had the Company had to pay no higher prices for coal,

material, &c., than in 1896, we give the following in contrast with the actual expenditure in 1896 :—

—	1900-1 at 1896 prices	1896	Increase	
	£	£	£	%
Gross earnings . . .	11,181,000	9,608,000	1,573,000	16·37
Expenditure—				
Wages	2,816,000	2,362,000	454,000	19·22
Material	773,000	664,000	109,000	16·37
Coal for locomotives .	400,000	344,000	56,000	16·37
Other	2,247,000	1,931,000	316,000	16·37
Total expenses . . .	6,236,000	5,301,000	935,000	17·64
Ratio to gross earnings .	(55·77)	(55·17)	(+ 60)	—
Net earnings	4,945,000	4,307,000	638,000	14·83

It will be noted that we have allowed in the above for the increase in expenditure in proportion to the growth in earnings. But inasmuch as the train mileage has not increased in proportion to the gross earnings, the actual expenditure of the past year would have been slightly less than given had the Company been able to purchase its stores and fuel as cheaply as in 1896.

Having thus arrived at the approximate amount which the expenditure would have reached had prices of material and coal not risen, we can now ascertain the approximate saving in expenditure which will be secured when prices fall back to

the 1896 level. We set out the calculation below :—

—	1900-1 at 1896 prices	Actual 1900-1	Increase or Decrease	
	£	£	£	%
Gross earnings . . .	11,181,000	11,181,000	—	—
Expenditure—				
Wages	2,816,000	2,816,000	—	—
Material	773,000	984,000	—211,000	—21·44
Locomotive coal . . .	400,000	886,000	—486,000	—54·85
Other	2,247,000	2,446,000	—199,000	—8·13
Total expenses . . .	6,236,000	7,132,000	—896,000	—12·58
Net earnings	4,945,000	4,049,000	+896,000	+22·12

Thus, when the Company is able to buy its coal and material as cheaply as it did in 1896, and such a time does not appear to be far distant, its expenditure will be reduced by no less than 896,000*l*. That is to say, the Company could witness a decline of no less than 8 per cent. in its gross earnings before its net earnings would be smaller than they were for the twelve months to June 30 last. So great a decline as 8 per cent. is very improbable. Indeed, even if we assume that the present depression will be somewhat more severe than that of previous periods, the shrinkage in gross earnings may not be more than about 3 per cent. or 4 per cent., or some 300,000*l*. or 400,000*l*. Consequently, if we allow for a very considerable increase in capital charges during the

next year or two, the Company will probably be able to pay a higher dividend than that distributed for the twelve months to June 30 last. To show how very small were the profits and dividends for the year to June 30, 1901, in contrast with those of the previous years, and especially of 1896, we give the following :—

—	1900-1901	1899-1900	1896
Average mileage	2,636	2,605	2,524
Gross earnings	£ 11,181,000	£ 10,973,000	£ 9,603,000
Expenses	7,132,000	6,618,000	5,301,000
Ratio.	(63·78)	(60·31)	(55·77)
Net earnings	4,049,000	4,355,000	4,307,000
Miscellaneous income . .	54,000	51,000	42,000
Net income	4,103,000	4,406,000	4,349,000
Interest on Debenture stock .	868,000	843,000	808,000
Rentals, &c.	644,000	647,000	697,000
Total charges	1,512,000	1,490,000	1,505,000
Profit	2,591,000	2,916,000	2,844,000
Dividend on Guaranteed and Preference stocks	1,482,000	1,484,000	1,455,000
Profit for Ordinary	1,107,000	1,432,000	1,389,000
Dividend	1,120,000 (4%)	1,422,000 (5½%)	1,388,000 (6%)
Balance	Dr. 13,000	Cr. 10,000	Cr. 1,000
Brought forward	33,000	23,000	42,000
Carried forward	20,000	33,000	43,000
Capital expended	93,509,000	91,590,000	84,653,000
Ordinary stock	28,000,000	27,085,000	23,133,000

To supplement the foregoing, we give a contrast of the dividends paid in each year from 1872 to 1900, and for the twelve months to June 30 last :—

1900-1	. . 4	1891	. . 6 $\frac{1}{4}$	1881	. . 5
1900	. . 4 $\frac{5}{8}$	1890	. . 6 $\frac{1}{2}$	1880	. . 5 $\frac{1}{8}$
1899	. . 5 $\frac{1}{2}$	1889	. . 6 $\frac{3}{8}$	1879	. . 4 $\frac{1}{8}$
1898	. . 3 $\frac{7}{8}$	1888	. . 5 $\frac{7}{8}$	1878	. . 3 $\frac{3}{4}$
1897	. . 6	1887	. . 5 $\frac{1}{2}$	1877	. . 3 $\frac{2}{3}$
1896	. . 6	1886	. . 5 $\frac{1}{4}$	1876	. . 4
1895	. . 5 $\frac{1}{8}$	1885	. . 5 $\frac{1}{2}$	1875	. . 4 $\frac{1}{4}$
1894	. . 5 $\frac{1}{4}$	1884	. . 6	1874	. . 4 $\frac{1}{2}$
1893	. . 4 $\frac{3}{4}$	1883	. . 6 $\frac{3}{8}$	1873	. . 6 $\frac{1}{4}$
1892	. . 5 $\frac{1}{8}$	1882	. . 6 $\frac{1}{4}$	1872	. . 6

We set out the amounts, prices, and yields afforded by the Company's stocks :—

—	Amount	Interest	Price Feb. 5, 1902	Yield
	£	%		£ s. d.
4 per cent. Debenture . . .	11,342,354	4	136 $\frac{1}{2}$	2 18 7
4 $\frac{1}{4}$ per cent. „ . . .	1,009,494	4 $\frac{1}{4}$	141 $\frac{1}{2}$	3 0 1
4 $\frac{1}{2}$ per cent. „ . . .	4,537,717	4 $\frac{1}{2}$	150 $\frac{1}{2}$	2 19 10
5 per cent. „ . . .	2,963,945	5	166 $\frac{1}{2}$	3 0 1
2 $\frac{1}{2}$ per cent. „ . . .	755,056	2 $\frac{1}{2}$	85 $\frac{1}{2}$	2 18 6
5 per cent. Rent Charge . . .	7,609,630	5	165 $\frac{1}{2}$	3 0 5
5 per cent. Consol. Guaranteed	17,846,464	5	167 $\frac{1}{2}$	3 0 7
5 per cent. Consol. Preference	11,826,683	5	164 $\frac{1}{2}$	3 1 9
Ordinary	28,262,545	4	138 $\frac{1}{2}$	2 18 7
Total	86,153,888			

CHAPTER XXI

THE NORTH-EASTERN RAILWAY—I

OFFICIAL FIGURES OF PASSENGER MILEAGE, TON MILEAGE,
AND TRAIN LOADS

To the North-Eastern Railway Company and its General Manager, Mr. George S. Gibb, belong the honour of having in this country under existing conditions first compiled in a scientific and proper manner the passenger and ton mileage, the average rates per passenger and per ton per mile, and the average train loads of passengers, merchandise, and minerals. We understand that the London and North-Western Railway has, since Mr. Harrison's visit to the States in 1896, estimated these important particulars, but, so far as we can learn, has not compiled them upon principles which leave no doubt as to their accuracy. Of course, it is greatly to the credit of the North-Western that it has in the past sufficiently appreciated the importance of ton mileage and train load results to make even an approximate calculation. With this single exception,

we believe that no English railway has in the past considered the compilation of the data which, in the United States and elsewhere, are judged to be absolutely essential to the economical working of traffic, as worth the trouble of doing, or as warranting the relatively small cost which would be incurred.

As our study of American railway methods of working in recent years has shown us the vital importance of this information to our railways in these days of keen international competition for trade, we have special pleasure in announcing that the North-Eastern has compiled absolute information with respect to these matters for a test period, and that we are able to publish the results obtained. Indeed, there is cause for still greater satisfaction. We are also authorised by Mr. Gibb to state that the North-Eastern will for the future regularly compile passenger and ton mileage figures and all the other data which can be deduced therefrom after the methods adopted by American railways. This means that the Company will in future regard its unit of earnings and cost of working as the ton mile and the passenger mile in place of the untrustworthy train mile.

This announcement was welcomed by a large number of shareholders, and the desire was expressed that other railway companies would come to a similar decision.

THE FREIGHT TRAFFIC

Before proceeding to other matters which form part of the movement towards greater economy of working, we will first present the official figures, and will explain the method by which they have been compiled. Below are the receipts from goods, live stock, and minerals, the average rates per ton per mile, and the ton miles in 1900, together with the footnotes as supplied to us by the Company :—

THE NORTH-EASTERN RAILWAY

Freight Receipts, Rates per Ton Mile, Year 1900

Description	Receipts	Rate per ton mile	Ton miles
	£	d.	
Goods	2,894,801	1·642 ¹	423,113,568
Live stock	105,661	3·5 ²	7,245,040
Minerals	3,057,051	·99 ¹	741,103,757
Total	6,057,514	1·241	1,171,462,365

¹ Actual based on a return for the month of May 1901.

² Estimated by *The Statist* for London and North-Western and Midland.

The Company has arrived at the average receipts per ton per mile for goods and minerals by taking out for the whole of the month of May detailed particulars of each individual consignment as to weight, distance, and the receipts obtained. It multiplied the weight by the distance to obtain the

ton mileage, and it divided the ton mileage into the receipts to obtain the average rates per ton per mile. Having thus obtained the ton mileage, and being already in possession of the mileage of merchandise and live-stock trains and of the mineral trains, it could at once obtain the average train loads of merchandise, minerals, and total freight. The average loads moved by the North-Eastern in 1900 were as follows:—

THE NORTH-EASTERN RAILWAY, YEAR 1900

Average Loads of Merchandise, Mineral, and Total Freight Trains

Description	Tons carried one mile ¹	Train miles	Average load per train ¹
Merchandise and live stock .	430,358,608	9,576,325	44·18
Mineral	741,103,757	8,012,440	92·49
Total freight. . .	1,171,462,365	17,588,765	66·60

¹ Excluding free haulage.

Thus the average train load of merchandise and live stock in 1900 was 44·18 tons, of minerals 92·49 tons, and of total freight 66·60 tons. These figures are exclusive of the quantity of the merchandise and minerals intended for the Company's own consumption, for which nothing is credited to revenue. Including the Company's own freight—that is to say, the tonnage hauled free—the average loads would be somewhat larger. As regards minerals, it should be

understood that the average load of loaded trains only—excluding the returning empty trains—was double that given, or 184·98 tons; but in calculating the average load it is, of course, necessary to include both the full and empty train mileage. The cost of moving the returning empty train, indeed, differs but little from that of handling the full train. Hence ability to curtail the number of mineral trains running with full loads has a double effect upon the average load owing to the resulting disappearance of a corresponding number of empty trains.

The next thing is to show the average length of haul—a very important matter when an opinion has to be formed as to whether a company's rates are high or low. This is done by dividing the tonnage moved into the tons carried one mile. As tons multiplied by mileage constitute the ton-mileage, it follows that ton-mileage divided by the tonnage gives the average mileage. The calculation is as follows:—

THE NORTH-EASTERN RAILWAY, YEAR 1900

Average Haul of Freight

Ton mileage	1,171,462,365
Tonnage, including live stock	52,697,362
Average length of haul (miles)	22·23

We would point out that the average haul of 22·23 miles is a short one compared with the average haul of the North-Western, the Midland, or the Great Western, and that this in a measure accounts for the

apparently high average rate secured by the North-Eastern as compared with the averages of the other lines just mentioned. To appreciate the important effect which the length of haul has upon the average rate per ton per mile, it has to be borne in mind that railway mileage rates are governed by the distance transported. The shorter the distance the higher the average rate per ton per mile, and the longer the distance the lower the rate. The charges of the North-Eastern are based upon a relatively high rate for the first ten miles, upon a lower rate for the next ten, a still lower rate for the succeeding fifteen, and after the goods or minerals have traversed over thirty-five miles, the lowest rate comes into operation.

That the reader may appreciate the very great effect which distance has upon the average rate charged per mile, we will show the difference between the North-Eastern's charge for coal for shipment for a distance of sixteen miles and for thirty-two miles respectively, including waggon hire and a shipping charge of 2*d.* per ton. The calculation is as follows :—

*Charge for Coal for Shipment, including Waggon Hire and
2*d.* per Ton for Shipping*

			Total charge <i>d.</i>		Average rate per ton per mile <i>d.</i>
16 miles	..	.	17·8	=	1·113
32 miles	.	.	25·8	=	·806

As the North-Eastern's average haul is short, as it owns many more waggons in proportion to its traffic than the North-Western or the Great Western, and seems to have rather more than the Midland, and as its receipts include a charge of 2*d.* per ton for shipping nearly 40 per cent. of its total traffic, it would appear that its average coal rate, were it working under similar conditions, would be no higher than those of the North-Western, of the Midland, or of the Great Western Companies.

Having thus shown how the Company has compiled its ton mileage, its average rate per ton per mile, its average load, and its average haul, we present below a summary of the results from freight traffic :—

THE NORTH-EASTERN RAILWAY, YEAR 1900

Freight Traffic Results

Tons carried one mile (excluding free haulage)	. 1,171,462,365
Freight train miles . . . . .	. 17,588,765
Train load merchandise and live stock, tons . . . . .	. 44.18
do. minerals, tons . . . . .	. 92.49
do. total freight, tons . . . . .	. 66.60
Average haul, miles . . . . .	. 22.23
Earnings . . . . .	. £6,057,514
Average rate per ton mile . . . . .	. 1.241 <i>d.</i>
Earnings per train mile . . . . .	. 82.65 <i>d.</i>

THE PASSENGER TRAFFIC

To arrive at its average rates per passenger per mile the Company compiled detailed particulars of the fare received from, and the distance travelled by, each passenger other than season-ticket holders

during the whole of the month of September 1900. The result showed that its average rate per first-class passenger per mile was only 1·42*d.*, and per third-class passenger only ·64*d.* These are much lower average rates than those charged by the North-Western, the Midland, and the Great Western Companies. The difference is doubtless due to the fact that the North-Eastern enjoys the monopoly of passenger traffic over nearly three counties, that it is able to make considerable reductions in return fares, and that it is free to develop its passenger traffic in its own way without having to study the wishes or possible retaliatory action of competitors. As the North-Eastern's receipts from first- and third-class season tickets are much the same in proportion to each other as the Midland's, and as the charges of the two Companies are also much the same, our estimate of the Midland's average rate per passenger per mile for season tickets has been adopted. On the next page is the statement supplied by the North-Eastern of the number of its passengers, its receipts, the rate per passenger per mile, and the number of passengers carried one mile in 1900.

Having obtained the passenger mileage, the average number of passengers per train is readily seen, and by dividing the number of passengers carried into the passenger mileage the average distance travelled by each passenger is ascertained.

THE NORTH-EASTERN RAILWAY, YEAR 1900

Passengers, Receipts, Rates, and Passenger Miles

Description	Number of passengers	Receipts	Rate per passenger per mile	Number of passengers carried one mile
		£	d.	
First . .	1,442,486	202,503	1·42 ¹	34,225,859 ¹
Third . .	55,666,538	2,030,693	·64 ¹	761,509,875 ¹
Contract . .	10,662,600 ²	186,667	·31 ³	144,516,387
Total . .	67,771,624	2,419,863	·617	940,252,121

¹ Based on return for September 1900 figures.

² This number has been reached by reducing the quarterly tickets to yearly and allowing for 600 journeys to each yearly ticket.

³ Estimated by *The Statist* for Midland.

The following were the passenger train miles, the number of passengers per train, and the average distance travelled per passenger in 1900 :—

THE NORTH-EASTERN RAILWAY, YEAR 1900

Passengers per Train and Average Distance

Description	Passenger train miles	Passengers per train	Average distance per passenger
		No.	Miles
First . . .	—	2·27	23·72
Third . . .	—	50·54	13·67
Contract . .	—	9·59 ¹	13·55 ¹
Total . .	15,064,851	62·40	13·87

¹ Estimated.

To show in a comprehensive manner the passenger traffic results in 1900 as to passenger mileage, the

passenger train mileage, the number of passengers per train, the average distance travelled, the earnings from passengers, the earnings per passenger per mile, the earnings from passengers per train mile, the total earnings of passenger trains, and the receipts of passenger trains per mile, we set the figures out below :—

THE NORTH-EASTERN RAILWAY, YEAR 1900

Passenger Traffic Results

Passengers carried one mile	940,252,121
Passenger train miles	15,064,851
Number of passengers per train	62·40
Average distance carried, miles	13·87
Earnings from passengers only	£2,419,863
Earnings per passenger per mile	·617 <i>d</i> .
Earnings from passengers per train mile	38·54 <i>d</i> .
Total earnings of passenger trains	£2,885,251
Receipts of passenger trains per mile	45·96 <i>d</i> .

THE NEW METHODS OF WORKING

The compilation of the foregoing detailed information means, first, that the officers of the North-Eastern intend to adopt the statistical methods which have proved so beneficial to the railroads of other countries ; secondly, that the General Manager will possess accurate information of the cost of moving a ton and a passenger, and that he will be able to justify either to the Railway Commissioners or to the customers of the Company any rates which may be made after the cost of carrying the individual article has been

considered ; thirdly, that a much better knowledge of the capacity and diligence of employés on various sections of the system in keeping down the train mileage will be obtained ; and, lastly, that the great possible savings in train mileage and in expenses by loading trains and cars more heavily have become strikingly evident. The results of the knowledge obtained are already apparent. Mr. Gibb, who for a long time past has held the opinion that loads in this country could be greatly increased, has recently visited the States, accompanied by Mr. Philip Burt, the general traffic manager, Mr. C. Harrison, the engineer, Mr. T. M. Newell, the dock engineer, and Mr. W. Worsdell, the locomotive superintendent, for the purpose of ascertaining the experience of American companies in the matter of economical working, and of enabling his staff to obtain the information necessary for the work they have before them. The visit, we understand, was both pleasant and of great value, and many hints have been gained as to improved methods of handling traffic. We may mention, however, that from the coal shipping facilities at Baltimore, which are the most approved in the States, nothing fresh could be learned, as they were found to be planned on lines similar to those which the North-Eastern already has in working at Tyne Dock. Thus the staff of the North-Eastern now has the knowledge and the data

which will enable it to work the system on the most modern principles.

Already the Company has placed an order for a considerable number of 32-ton hopper-bottom coal trucks, which it will be able to use at both the Tyne and Blyth Docks, where facilities already exist for handling the large waggons, and at several collieries on the line whose appliances are also suitable for using large waggons. Doubtless the experience which will thus be gained, both by the Company and by traders, as to the economy of larger trucks will conduce to the spread of their use throughout the country. The Company has also placed an order for twenty locomotives with a capacity 54 per cent. greater than its previous most powerful engines. Of course, expectations of very rapid and great increase in the average train load of the North-Eastern or of any other railway in this country are not justified. In the first place, the number of collieries and works which have facilities for using larger waggons is limited, and the process of inducing traders to adapt their works to modern conditions may be somewhat slow. Further, the task of constructing and replacing the existing large number of engines by others of greater capacity must necessarily be spread over a considerable period. Nor is the railway Company likely to at once replace a large portion of its existing light-waggon stock with cars

of much greater capacity. But the important point is that our railways in general, and the North-Eastern in particular, are now moving as rapidly as possible in the right direction—firstly, by compiling the necessary data; secondly, by building locomotives and waggons of greater capacity; and, thirdly, by insisting that the loads of small waggons moved by the existing engines should be more in proportion to the capacity of the engines than they have been in the past. By the latter method an immediate and very considerable increase in the train load, and consequent reduction in train mileage, will be effected. As the number of larger engines increases the average load will steadily grow, and as traders' works and dock facilities are reconstructed and larger waggons take the place of existing small trucks, a further very marked growth will occur.

In view of the national importance of the matter we purpose this week¹ merely to publish the official figures supplied to us by Mr. Gibb; but we may point out that these figures will enable the reader to test the accuracy of the estimates we have placed before him with respect to the average rates per ton per mile secured by the London and North-Western, the Great Western, and the Midland Companies, and of the train loads now moved by those Companies. It should be understood that the

¹ December 14, 1901.

information available to the public with respect to the average rates per ton per mile and the average rates per passenger per mile is extremely meagre, and that, even with the assistance which has been generously given to us by the Companies concerned, there has been very great difficulty in presenting figures which could be regarded as approximately correct. The purpose we had in view was to show as nearly as possible how extremely small are the existing train loads of our railways, not merely in comparison with those of the States, but relatively to the possible loads which can be obtained in this country by thought and care and a slight change in the methods of working. In compiling the estimated rates we were desirous of placing them rather under than over the actual average, in order that the Companies might have the benefit of the doubt; the lower the rate and the greater the revenue, the larger would, of course, be the ton mileage and the larger the train load. Consequently, the estimated average loads secured by the North-Western, the Midland, and the Great Western appear to have been rather less than greater than those we have given. The figures now supplied by the North-Eastern confirm in a remarkable manner the figures we have put forth. The average merchandise train load of the North-Eastern, as we have shown, works out at 44 tons and the average mineral train load at $92\frac{1}{2}$ tons,

whereas the average merchandise load we estimated for the North-Western was 45 tons, and the mineral load was 100 tons. The average loads of the Midland we placed at 90 tons of minerals and 34 tons of merchandise, and the average loads of the Great Western at 80 tons of minerals and 32 tons of merchandise. Thus it will be seen that the figures we gave are near to the actual, and that the average loads both of minerals and merchandise of the railways of this country are much lower than they probably will be in the not distant future. Below we set out a contrast of the actual merchandise and mineral train loads of the North-Eastern with the estimated loads of the London and North-Western, the Midland, and the Great Western :—

Train loads	Actual. N.-Eastern	Estimated		
		L. and N.- Western	Midland	Great Western
	Tons	Tons	Tons	Tons
Merchandise . . .	44.18	45	34	32
Mineral . . .	92.49	100	90	80
Total freight .	66.60	69	58	57

Further, the reader will remember that we placed the possible increase in the average train load at 50 per cent. The new coal engines which the North-Eastern is constructing, of which some have already been delivered, have a capacity 54 per cent. greater

than those hitherto constructed. In response to our request for information as to the increased capacity of the new engines as compared with those at present in use, Mr. Gibb has kindly supplied us with the following:—

Hauling Capacity of the Most Powerful Classes of Mineral Engines owned by the North-Eastern Railway Company

Year	—	On level track. Speed, miles per hour	
		15	20
1896	Class P . . .	Tons 1,232	Tons 1,097
1901	Class T . . .	1,897	1,689
	Increased power .	665 = 54 %	592 = 54 %

NOTE.—These figures are for gross weight, including engine, tender, trucks, and load. Class T engine is Mr. Worsdell's latest type, of which twenty are under construction.

We wish it to be distinctly understood that Mr. Gibb is not responsible for our estimate of a possible increase of 50 per cent. in the average train load. But we may fairly point out that even under existing conditions preparations have been made for increasing the heaviest class of train loads by over 50 per cent., and that although several years may pass before an all-round increase of 50 per cent. can be expected, yet we believe we are justified in anticipating a still larger percentage improvement in the more distant future. With respect to these more powerful engines, we

would point out that Mr. Burt, the traffic manager of the North-Eastern, has provided that the engines should carry the greater loads shown at the same speed as the engines now in use, and that Mr. Worsdell, the locomotive superintendent, has been able to fulfil this condition.

The introduction of waggons of large capacity on to the North-Eastern system will probably be an easier operation than it will be for other railways. The North-Eastern owns a large number of docks, and it will require nobody's assistance or sanction to provide all its docks with appliances for accommodating large waggons. Moreover, the quantity of coal shipped by the North-Eastern is very large, and when all the docks have been altered it will be possible to carry practically the whole of the coal in larger trucks if colliery owners will agree to load the larger waggons. But other Companies have a double task. In the first place, they will have to obtain the co-operation of collieries; and, in the second place, the co-operation of mills, gasworks, factories, coal merchants, and docks, which consume or distribute the coal. To show how large is the quantity of coal shipped by the North-Eastern, we have asked for, and been furnished with, a detailed statement of the quantity of coal shipped from the various docks and staiths served by the Company. The statement is as follows :—

THE NORTH-EASTERN RAILWAY

Return of Coal and Coke conveyed over the North-Eastern Railway for Shipment during the Year 1900

Coal and coke shipment	Total tons
Tyne Dock	6,694,684
Hilda Drops	133,349
Redheugh Drops	446
Dunstan Staiths	1,351,480
Whitehill Point	185,746
Northumberland Dock	594,797
Albert Edward Dock	335,594
North Blyth	2,027,385
South Blyth	1,150,273
Sunderland Dock	979,141
Wearmouth Dock	5,722
Pallion Staiths, &c.	1,417,920
Londonderry Drops	315,472
Middlesbrough	233,623
South Stockton	12,283
Portrack Spout	3,590
East Hartlepool Dock	503,650
West Hartlepool Dock	644,329
Miscellaneous	1,401,061
Hull	1,766,238
Selby	3,224
Goole, N.-E.	41,217
Total shipment	19,801,224

In 1900 the total amount of coal and coke carried by the Company was as much as 33,316,000 tons, and the amount shipped represents no less than 60 per cent. of this total. A large portion of the remainder is supplied to the great works for the manufacture of iron and steel and other heavy goods in the North-Eastern district, which could with very slight alteration take delivery in large waggons.

Further, last year the Company carried over 5,000,000 tons of ironstone and 2,213,000 tons of lime and limestone to the blast furnaces, which could also be shipped and received without much difficulty in larger waggons. Consequently, the number of large waggons which the Company will in the future be able to use will be very great. As large waggons are of such great importance to the Company and to trade, and will materially assist it in effecting great economies in the cost of moving traffic, we set out below the particulars which have been supplied to us of the hopper trucks which the Company has ordered to be constructed.¹

Particulars of Hoppered Trucks for the Carriage of Coal, now being built by the Darlington Waggon Company for the North-Eastern Railway Company¹

SOME LEADING DIMENSIONS

Carrying capacity	32 tons
Length over buffers	39 feet 10 inches
Width over all	7 „ 11 $\frac{7}{8}$ „
Height from rail to curb	9 „ 0 $\frac{1}{2}$ „
Wheel-base of bogies	5 „ 3 „
Tare weight	13 tons
Paying load per cent. of gross weight	71.1
Tare weight per cent. of gross weight	28.9
Tare weight per cent. of paying load	40.6

To show the saving in dead weight and in the length of the trains by the use of larger waggons, we

¹ The Company has now ordered fifty 40-ton hoppered trucks with a tare weight of 14 $\frac{1}{4}$ tons. The dimensions are similar to the 32-ton trucks except that they are about 10 ft. high instead of 9 ft —February 5, 1902.

set out below the weight and length of a train consisting of twenty 32-ton trucks, and the weight and length of a train of sixty-four 10-ton trucks, both having an aggregate net load of 640 tons:—

—	Twenty 32-ton trucks	Sixty-four 10-ton trucks	Difference in favour of larger trucks %	
Carrying capacity, tons . .	640 .	640	—	—
Tare weight, tons . . .	260 .	406·4	- 146·4	- 36
Gross weight, tons . . .	900 .	1,046·4	- 146·4	- 14
Paying load per cent. of gross weight . . .	71·1	61·2	+ 9·9	+ 14
Tare weight per cent. of gross weight . . .	28·9	38·8	- 9·9	- 25
Tare weight per cent. of paying load . . .	40·6	63·4	- 22·8	- 36
Length	796 ft. 8 in.	1,146 ft. 8 in.	- 350 ft.	- 301

Expressed differently, the calculation indicates that by using the heavier trucks the Company will move 15 per cent. more freight without any addition to the gross weight of the existing train and with a diminution in the length of about 220 feet, or nearly 20 per cent.

To show what a very large proportion of the Company's traffic consists of minerals, we give below the total tonnage of goods and minerals carried in 1900 :

THE NORTH-EASTERN RAILWAY, YEAR 1900

Proportion of Goods and Mineral Traffic

	Tons	%
Goods	11,814,741	22·56
Minerals	40,549,238	77·44
	<u>52,363,979</u>	

From the above it will be seen that over 77 per cent. of the Company's traffic consists of minerals. The mineral traffic is made up as to 80 per cent. of coal and coke, 5 per cent. of lime and limestone, and 12 per cent. of ironstone, as will be seen from the following:—

								Tons
Coal and coke	.	.	.	.	.	.	.	33,316,191
Lime and limestone	.	.	.	.	.	.	.	2,213,779
Ironstone	.	.	.	.	.	.	.	5,019,268
								<hr/> 40,549,238

We leave to the next chapter the discussion of the financial outlook of the Company, as we do not wish that the Company's figures which we have the privilege of placing before our readers should be in any way confused with our own estimates and calculations of the results which may be secured by the Company in the future.

In conclusion, we would point out that the policy and action of the North-Eastern Railway in endeavouring to adopt new methods of working prove that our great industries will take the measures necessary to the maintenance of the country's high position in the commercial world, and that we can look forward with confidence to the unlimited growth of the nation in wealth and in population.

.

CHAPTER XXII

THE NORTH-EASTERN RAILWAY—II

WERE there no other evidence of the ability of the management of the North-Eastern, the information we give in the last chapter would be sufficient to indicate that men of progressive and enlightened views control the line. But the measure is only one of many which have shown wisdom and foresight. Firstly, the Company gives so good a service to the three counties it serves that there is no attempt on the part of neighbouring and powerful railways to contest its monopoly. Under ordinary conditions a monopoly must be regarded with disfavour; but the reason against monopoly disappears when, in place of a bad service and high fares, it means a better service and lower fares than would be given by a competitive service. A monopoly which maintains its position by giving the best possible service at the lowest cost is, indeed, one which should receive the support of every thinking man. Such a monopoly means that the waste which arises from excessive competition is avoided, and that the public secure the advantage

which is lost when dividends have to be earned upon duplicate amounts of capital, when wages have to be paid to duplicate staffs of employes, and when a vast number of unnecessary trains are run.

A second indication of the foresight of the management is shown in the liberal sums which are devoted to the maintenance of its permanent way and of its rolling-stock. There is an impression abroad that our railways do not adequately maintain their property out of revenue. So far as the North-Eastern is concerned this idea is not warranted. When the Company increases the weight of its rails, the additional weight is charged to revenue, and not to capital. When light locomotives are replaced by others of a heavier type, no charge whatever is made to capital for the additional power. The improved engines take the place of the old at the cost of revenue. Further, when carriages or waggons have to be replaced by others of an improved and more costly type, no charge is made to capital, but the whole cost is met out of revenue. Of course additional rolling-stock needed by growing business, and not to replace old rolling-stock, is necessarily charged to capital. This policy means that the capacity of the rolling-stock is being gradually increased, and that the value of the roadway is being fully maintained. Thus, were the road and rolling-stock to be revalued to ascertain if they were worth the sums

charged to capital, there would be no deficiency ; the appreciation in value in certain directions would make good the depreciation resulting from the expiration of a portion of the life of the rails, ties, bridges, rolling-stock, &c. In other words, the Company amply provides for depreciation. As we hope at some future time to deal with the question of depreciation and maintenance of railway property and rolling-stock, we leave the matter for the present. Nevertheless, the policy of the North-Eastern in this respect must be strongly commended.

A third indication of the foresight and judgment of the men who have controlled the North-Eastern in the past is shown by their policy in acquiring and improving a large number of docks, in order that the railway might give every assistance to collieries, iron, and other works in the shipment of their products, either coastwise or to foreign countries, a policy by which Northern industries have been enormously stimulated.

Another evidence of the sound business principles which are held is the existence of a sliding scale for regulating the carriage rates for iron-making materials. This sliding scale means that when the iron trade is flourishing and prices are high the Company participates in its prosperity, and that when the price of iron is low the Company shares with ironmasters and wage-earners the burden of meeting the competition

of other districts by carrying iron-making materials at low rates. Such a provision stimulates the railway to effect economy in railway working, in order to earn a profit from the carriage of iron-making materials when the minimum rates are in force. It will be evident that the industry which has the smallest amount of fixed charges to meet in the shape of wages and transport charges is the better able to compete in times of depression with the industries which have a larger proportion of fixed charges. That is to say, other things being equal, iron can be produced in the Cleveland and Durham districts more cheaply than in other districts by reason, first, of the sliding scale of wages, and, secondly, of the sliding scale of railway charges. And now these advantages are to be increased by the introduction of larger engines, larger waggons, heavier train loads, and more economical railway working.

Before passing to the examination of the earnings and profits of the Company we may mention a matter of some interest, which indicates that the management is desirous of adopting any method of working which has been found of advantage in the United States, and which may be found applicable to English railways.

Arrangements have just been made with the 'Hall' Signal Company of New York for the provision

on the main line of the North-Eastern Railway near York of an *experimental* installation of their system of automatic signalling, which is at present in force over long distances on the great majority of the American railroads. The 'Hall' system, which is purely automatic, is designed to enable the services of signalmen to be dispensed with except at the points of junction. It is operated by electricity by means of connections set up by the trains themselves. When a train has passed a signal the electric current is diverted from an electro-magnet in the signal case, so that the signal automatically falls to 'danger' through the force of gravity, and there it remains so long as a pair of wheels remains on the track. A broken rail, a carriage which may have become detached, or any derangement or trouble with signal apparatus, will give the signal of 'danger,' the force of gravity alone being employed for that purpose. To secure perfect electrical continuity between the successive rails of a section wire bonds are carried from rail to rail. A hole is drilled in the end of each rail near the fishplate, and a copper wire is keyed into the hole thus formed. There are thus alternative paths for the current at each joint—it can go through the fishplate or through the bond, or can divide itself between the two. At each end of the section a thin piece of vulcanite, or other insulating material, is placed in the rail joint between

the fishplate and the rail, thus insulating the rails of one section from those of the next. The right and left metals of the track are insulated one from the other by the wooden sleepers. When there is a train in the section there is a current flowing in series through one rail, a relay, and a second rail. The effect of the current is to hold the tongue of the relay up against its stop, this tongue forming part of a second circuit. Immediately a train enters the section there is direct communication from rail to rail and the relay is short-circuited, practically all the current being diverted from its coils, and passing through the axles and wheels of the vehicles. The tongue of the relay then falls away, breaking the first signal circuit and completing a second. With this system of signalling it is stated there has never been a case of a signal failing to operate; and, in addition to reducing the wages bill, it is maintained that the system is calculated to increase the carrying capacity of railways by enabling the block sections to be shortened without the expense of erecting and 'manning' additional signal boxes.

During the past five years the Company's earnings have shown very great expansion. For the twelve months to June 30 last the earnings of its passenger trains showed an increase of no less than 577,000*l.*, or 24·20 per cent., compared with the receipts for 1896. All classes of traffic contributed towards this

large sum. The improvement in the first class receipts was over 42 per cent., in the third class nearly 24 per cent., in the season tickets nearly 36 per cent., and in parcels, horses, &c., $19\frac{1}{2}$ per cent. To show the great expansion which has occurred in the passenger receipts during the past $4\frac{1}{2}$ years, we give the following contrast:—

Receipts of Passenger Trains

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
First class .	208,000	195,000	146,000	+ 62,000	+ 42·46
Second „ .	—	—	3,000	— 3,000	— —
Third „ .	2,088,000	1,962,000	1,689,000	+ 399,000	+ 23·62
Season . .	193,000	180,000	142,000	+ 51,000	+ 35·91
Parcels, horses, &c. . .	411,000	389,000	344,000	+ 67,000	+ 19·48
Mails . .	61,000	61,000	60,000	+ 1,000	+ 1·66
Total . .	2,961,000	2,787,000	2,384,000	+ 577,000	+ 24·20

This large increase of over 24 per cent. in receipts has been attended by an increase of only 14 per cent. in the mileage of passenger trains, and the improvement in the receipts per passenger train has been as much as 8·9 per cent. That is to say, the loading of the trains last year was nearly 9 per cent. greater than in 1896.

We contrast on the next page the earnings and mileage of passenger trains with the receipts of passenger trains per mile in the past two years and in 1896.

Q

—	1900-1	1899-1900	1896	Increase 1901 compared with 1896	
					%
Earnings of passenger trains.	£2,961,000	£2,787,000	£2,384,000	£577,000	24·2
Mileage of passenger trains.	15,134,000	14,944,000	13,274,000	1,860,000	14·0
Receipts of passenger trains per mile .	46·94d.	44·76d.	43·10d.	3·84d.	8·9

This improved loading contrasts favourably with that of the three other heavy lines. The increase in the North-Western's receipts per passenger train mile in the same period was only one-half of 1 per cent. The loading of the Midland's passenger trains was actually reduced by one-half of 1 per cent. The increased loading of the Great Western's trains in the same period was 7·3 per cent. We would, however, point out that the increased loading of the North-Eastern should be contrasted with the Great Western rather than with the North-Western and the Midland, as the two latter have had to face the competition of the Great Central, and have not considered it advisable to reduce passenger train mileage with a new competitor in the field. The result of the Great Central's extension to London has indeed been to increase the competition among the great lines, and greatly to increase the waste of train mileage. All the Companies affected have in fact been obliged to run a large number of trains which have not been needed by the public. But even contrasted with the Great

Western's increased train load, that of the North-Eastern is favourable. Further, it has to be borne in mind that the Great Western has in a large measure filled its trains more fully by offering greater attractions to third class passengers to travel in what were previously almost empty second class carriages, whereas the North-Eastern has filled its trains more fully in spite of its total abolition of second class carriages.

The growth in the Company's freight traffic has also been very great, the expansion in four and a half years having reached 854,000 l. , or nearly 17 per cent., the increase in merchandise having been 16.65 per cent., in live stock a little over 4 per cent., and in minerals 17½ per cent. Below we contrast the receipts from merchandise, live stock, and minerals for the twelve months to June 30, 1901, 1900, and 1896:—

Revenue from Freight Traffic

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
Merchandise .	2,865,000	2,861,000	2,456,000	409,000	16.65
Live stock .	102,000	104,000	98,000	4,000	4.08
Minerals .	2,970,000	2,969,000	2,529,000	441,000	17.43
Total .	5,937,000	5,934,000	5,083,000	854,000	16.80

In the transportation of its goods traffic very considerable economies appear to have been effected,

the increase of 16·8 per cent. in the earnings of freight trains having been attended by an addition of only 8·2 per cent. to the freight train mileage. Hence the receipts of freight trains per mile increased by 8 per cent. That is to say, gauged by the receipts per train mile the load increased by 8 per cent. It should, however, be borne in mind that the comparatively high rates which the Company secured during the twelve months to June 30, 1901, compared with the rates obtained in 1896, for the carriage of iron-making materials, are in some measure responsible for the increased receipts per train mile. While train-mile receipts are always misleading as a guide to train loads, without the knowledge of the average rates per ton per mile secured, they are specially misleading for purposes of comparison when freight rates fluctuate under a sliding scale. Mr. Gibbs's action, in compiling train-load figures in tons, will entirely remove any misconception which might arise from the mere examination of the earnings per freight-train mile. Increased freight rates under the sliding scale mean increased receipts per freight-train mile, and reduced freight rates mean reduced receipts per freight train with the same load. It is by contrasting the train and car *loads* and the loads per *engine*, not the receipts per train mile, that an accurate opinion can be formed as to whether a railway is or is not economically administered. Gauged by what has

hitherto been regarded in England as the test of economical management, the North-Eastern has effected important economies in freight-train mileage since 1896. Gauged by the train load and engine mileage test, it has effected some economy, but less than is indicated by the increased receipts per freight-train mile. To show the considerable increase in the average earnings of freight trains since 1896 we contrast below the earnings and mileage of freight trains and the receipt of freight trains per mile in the years ended June 30, 1901 and 1900, and in the calendar year 1896 :—

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
Earnings of freight trains . . .	£5,937,000	£5,934,000	£5,083,000	£854,000	% 16·8
Mileage of freight trains . . .	16,928,000	17,566,000	15,640,000	1,288,000	8·2
Receipts of freight trains per mile .	84·17 <i>d.</i>	81·07 <i>d.</i>	78·00 <i>d.</i>	6·17 <i>d.</i>	7·9

As we have not the mineral-train mileage for the June half of 1901, we present a contrast of the earnings of merchandise, of minerals, and of total freight per train mile for 1900, compared with 1896, to show that the increased receipts per train mile has been chiefly, but not entirely, in minerals.

To indicate the measure of success obtained by the North-Eastern since 1896 in loading its trains more heavily, as gauged by the misleading receipts

THE NORTH-EASTERN RAILWAY—YEARS 1900 AND 1896

Earnings of Freight Trains

—	1900	1896	Increase	—
MERCHANDISE AND LIVE STOCK—				
Earnings	£3,000,462	£2,554,105	£446,357	17·47 %
Train miles	9,576,325	8,293,946	1,282,479	15·46
Earnings per train mile .	75·20 <i>d.</i>	73·91 <i>d.</i>	1·29 <i>d.</i>	1·74
MINERALS—				
Earnings	£3,057,050	£2,528,770	£528,281	20·89
Train miles	8,012,440	7,346,660	665,780	9·06
Earnings per train mile .	91·57 <i>d.</i>	82·61 <i>d.</i>	8·96 <i>d.</i>	10·84
TOTAL FREIGHT—				
Earnings	£6,057,513	£5,082,875	£974,638	19·17
Train miles	17,588,765	15,640,606	1,948,159	12·45
Earnings per train mile .	82·65 <i>d.</i>	77·99 <i>d.</i>	4·66 <i>d.</i>	5·97

per train mile, we contrast, first, the passenger receipts per train mile of the London and North-Western, the Midland, the Great Western, and the North-Eastern for the twelve months to June 30, 1901, with those for 1896 :—

Earnings per Passenger-train Mile

—	1900-1	1896	Increase or Decrease	
	<i>d.</i>	<i>d.</i>	<i>d.</i>	%
London & North-Western .	54·77	54·53	+ ·24	+ 0·5
Midland	45·30	45·48	— ·18	— 0·4
Great Western	54·55	50·83	+ 3·72	+ 7·3
North-Eastern	46·94	43·10	+ 3·84	+ 8·9

And, secondly, we contrast the earnings per freight-train mile of the four Companies in the two years.

Earnings per Freight-train Mile

—	1900-1	1896	Increase	
	<i>d.</i>	<i>d.</i>	<i>d.</i>	%
London & North-Western .	82·20	81·21	·99	1·3
Midland	65·99	63·72	1·97	3·1
Great Western . . .	60·45	59·77	0·48	0·8
North-Eastern . . .	84·17	78·00	6·17	7·9

In consequence of the saving effected by the increased loading of its trains and of the benefit derived from the higher rates for iron-making materials secured under the sliding scale, it is not possible to ascertain exactly to what extent the Company has suffered from the increase in expenditure arising from the advance in wages and the rise in prices of fuel and material. An increase of 18·54 per cent. in its gross earnings has been attended by an increase of 22·21 per cent. in wages, a difference of only 3·67 per cent. But gauged by train mileage, which in this case is the more accurate method of computing the additional expenditure incurred by reason of the increased traffic, the increase in expenditure would be only about 11 per cent., as against the increase of over 22 per cent. in wages. The Company was rather more fortunate than other lines in its coal contracts, owing to its practice of placing orders in December instead of in the spring, and in the June half of 1901, when other companies paid very largely increased sums for coal, the North-Eastern paid practically the same price as in the June half of last year. Hence, as compared

with 1896, its locomotive coal bill showed an increase of less than 104 per cent., as against the North-Western's increase of nearly 149 per cent., the Midland's increase of nearly 121 per cent., and the Great Western's increase of $157\frac{1}{2}$ per cent. The Company has, however, suffered as much as the other lines from the rise in the prices of material. The sum paid for materials in the twelve months to June 30 last was no less than 349,000*l.* (56·42 per cent.) greater than in 1896. The total expenses have increased by 1,455,000*l.*, or 32·89 per cent. since 1896, as against the increase in gross earnings of 18·54 per cent., and as against the increase in train mileage of 11 per cent. Below we set out the sums paid for wages, material, locomotive coal, and other purposes, together with the total expenses, gross earnings, and ratio of expenses to earnings in the twelve months to June 30 last, for the previous twelve months, and for 1896:—

Expenditure on Wages, Material, Coal, &c.

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
	£	£	£	£	%
Wages . . .	2,646,000	2,571,000	2,165,000	481,000	22·21
Material . . .	1,018,000	936,000	669,000	349,000	56·42
Locomotive coal	534,000	440,000	262,000	272,000	103·81
Other . . .	1,680,000	1,613,000	1,327,000	353,000	26·60
Total expenses	5,878,000	5,560,000	4,423,000	1,455,000	32·89
Gross earnings .	9,173,000	8,992,000	7,738,000	1,435,000	18·54
Ratio . . .	(64·79)	(61·83)	(57·16)	(7·63)	—

Assuming that the Company's expenditure for material, coal, and for other purposes other than wages had increased only in proportion to the growth in gross earnings, the increase in expenditure in the past year, as compared with 1896, would have been 889,000*l.*, in place of the actual increase of 1,455,000*l.* But gauged by the increased train mileage, and not by the gross earnings, the increase in expenditure, apart from the rise in prices, would have been only 729,000*l.*, as against the actual increase of 1,455,000*l.*

To show what would have been the increase in expenses in the twelve months to June 30 last had the Company had to pay no higher prices for coal, material, &c., than in 1896, we give the following in contrast with the actual expenditure in 1896 :—

—	1900-1 at 1896 prices	1896	Increase	
	£	£	£	%
Gross earnings . .	9,173,000	7,738,000	1,435,000	18·54
Expenditure—				
Wages	2,646,000	2,165,000	481,000	22·21
Material	793,000	669,000	124,000	18·54
Coal for locomotives	310,000	262,000	48,000	18·54
Other	1,573,000	1,327,000	246,000	18·54
Total expenses . .	5,322,000	4,423,000	899,000	20·32
Ratio to gross earnings	(58·03)	(57·16)	(·87)	—
Net earnings . . .	3,851,000	3,315,000	536,000	16·17

By contrasting the 1900-1 expenditure at the 1896 level of prices with the actual outlays of the past year we arrive at the probable reduction which will result from a renewed fall in prices of coal and material, &c., to the 1896 level. We would, however, again point out that the actual reduction may be greater than is shown below, as the Company has effected considerable economies since 1896 by loading its trains more heavily. To show the minimum reduction in expenditure to accrue from a decline in prices to the 1896 level we give the following:—

—	1900-1 at 1896 prices	Actual 1900-1	Increase and Decrease	
	£	£	£	%
Gross earnings . . .	9,173,000	9,173,000	—	—
Expenses—				
Wages	2,646,000	2,646,000	—	—
Material	793,000	1,018,000	-225,000	-22·10
Locomotive coal . .	310,000	534,000	-224,000	-41·94
Other expenses . . .	1,573,000	1,680,000	-107,000	- 6·37
Total expenses . . .	5,322,000	5,878,000	-556,000	- 9·46
Net earnings	3,851,000	3,295,000	+556,000	+16·87

It will be noted from the above that the estimated reduction in the coal bill when prices return to the 1896 level is placed at only 42 per cent., as against a reduction of about 50 per cent. in the case of the three other heavy lines. This, of course, is due in some measure to the fact that the Company was more

fortunate with regard to its coal contract in the June half of the present year. As it has not had to pay such high prices it will of course not derive so much benefit from a fall to a more normal figure. Bearing in mind, however, the increase in the Company's train load since 1896 we estimate that the actual reduction in expenditure which would accrue from a decline in prices to the 1896 level would be about 700,000*l*. That is to say, a decline of over $7\frac{1}{2}$ per cent. in the gross earnings could occur before the net earnings would fall beneath those secured for the twelve months to June 30 last if prices were to fall back to the 1896 level. Although the trade outlook is unpleasant and the Company will suffer from the reduction in the freight rates for the carriage of iron-making materials under its sliding scale, a decline in its receipts of 700,000*l*. seems most unlikely to occur.

Had it not been for the increase in capital charges the Company in the twelve months to June 30, 1901, would have been able to pay nearly the same dividend as it did in 1896, its net income for the twelve months having been 3,300,000*l*. as against 3,320,000*l*. in 1896. This was a much better comparison than was made by the three other heavy lines who do not enjoy the advantages or the disadvantages of a sliding scale arrangement. The Company's dividend, which in 1896 was $6\frac{3}{8}$ per cent., for the twelve months to June 30 last was $5\frac{3}{4}$ per cent., a

reduction of only $\frac{5}{8}$ per cent. Below we contrast the earnings, charges, profits and dividends for the twelve months to June 30 last, for the previous year, and for 1896. We also set out the total capital expended at the end of the years mentioned and the amount on the Ordinary stock ranking for dividend in each year :—

—	1900-1901	1899-1900	1896
Average mileage . . .	1,656	1,634 $\frac{1}{4}$	1,596 $\frac{5}{8}$
	£	£	£
Gross earnings . . .	9,173,000	8,992,000	7,738,000
Expenses	5,878,000	5,560,000	4,423,000
Ratio	(64·08)	(61·83)	(57·16)
Net earnings	3,295,000	3,432,000	3,315,000
Miscellaneous income .	5,000	5,000	5,000
Net income	3,300,000	3,437,000	3,320,000
Interest on Debenture stock	678,000	672,000	661,000
Rentals	37,000	35,000	38,000
General interest . . .	53,000	34,000	28,000
Total charges	768,000	741,000	727,000
Profit	2,532,000	2,696,000	2,593,000
Dividend on Guaranteed and Preference Stocks .	875,000	875,000	870,000
Profit for ordinary . . .	1,657,000	1,821,000	1,723,000
Dividend	1,656,000 (5 $\frac{3}{4}$ %)	1,827,000 (6 $\frac{1}{2}$ %)	1,720,000 (6 $\frac{3}{8}$ %)
Balance	Cr. 1,000	Dr. 6,000	Cr. 3,000
Brought forward . . .	35,000	41,000	29,000
Carried forward	36,000	35,000	32,000
Capital expended . . .	73,406,000	71,688,000	68,408,000
Ordinary stock	28,800,000	28,107,000	26,981,000

To supplement the foregoing we give below a contrast of the dividends paid in each year from 1872 to 1900, and for the twelve months to July 30 last :—

	%		%		%
1900-1 . . .	$5\frac{3}{4}$ ¹	1891 . . .	$6\frac{1}{2}$	1881 . . .	8
1900 . . .	$6\frac{3}{8}$	1890 . . .	$7\frac{1}{4}$	1880 . . .	$8\frac{1}{4}$
1899 . . .	$6\frac{5}{8}$	1889 . . .	$7\frac{1}{4}$	1879 . . .	$5\frac{7}{8}$
1898 . . .	$6\frac{1}{2}$	1888 . . .	$6\frac{1}{4}$	1878 . . .	$6\frac{1}{2}$
1897 . . .	$6\frac{3}{8}$	1887 . . .	$5\frac{5}{8}$	1877 . . .	$6\frac{7}{8}$
1896 . . .	$6\frac{3}{8}$	1886 . . .	$5\frac{3}{8}$	1876 . . .	$7\frac{3}{8}$
1895 . . .	$5\frac{5}{8}$	1885 . . .	6	1875 . . .	$8\frac{1}{2}$
1894 . . .	$5\frac{7}{8}$	1884 . . .	$6\frac{7}{8}$	1874 . . .	$8\frac{1}{4}$
1893 . . .	$5\frac{7}{8}$	1883 . . .	$8\frac{1}{4}$	1873 . . .	$9\frac{1}{4}$
1892 . . .	$4\frac{7}{8}$	1882 . . .	$8\frac{1}{8}$	1872 . . .	9

¹ For the year ended December 31, 1901, the dividend has been $5\frac{1}{4}$ per cent.

Thus, at no time since 1872 has the dividend been less than $5\frac{1}{4}$ per cent. with the exception of 1892, when a distribution of only $4\frac{7}{8}$ per cent. was made in consequence of the Durham coal-miners' strike. Further, it should be noted that the increase in the dividend from 1895, when trade was slack, to 1899, when it was active, was only from $5\frac{5}{8}$ to $6\frac{5}{8}$ per cent. This relatively small increase in the dividend, in comparison with the improvements in previous periods, when the iron trade was active, is attributable to the liberal policy supported by Mr. Gibb, of spending money freely during a period of trade activity upon the road and rolling-stock with a view to economical working in a period of depression and of thus

reducing to a minimum the effect upon dividends of fluctuation in trade.

Below we set out the amounts and prices of the Company's stocks and the yields afforded :—

—	Amount June 30, 1901	Interest	Price Feb. 5 1902	Yield
	£	%		£ s. d.
3% Debenture stock . . .	22,690,493	3	102½	2 18 10
Great North of England Purchase shares . . .	74,087	4	—	—
4% Guaranteed stock . . .	8,466,903	4	133½	3 0 10
4% Preference stock . . .	13,321,227	4	130½	3 2 3
Ordinary stock . . .	29,019,448	5¼ ¹	155½	3 8 10
Total . . .	73,572,157	—	—	—

¹ Dividend for calendar year 1901.

CHAPTER XXIII.

THE NORTH-EASTERN RAILWAY—III

REORGANISATION OF TRAFFIC DEPARTMENT

*Object: Heavier Loads and Economical Handling
of Traffic*

THE decision of the North-Eastern Railway to compile ton and passenger mileage figures in order to ascertain the train loads moved and other important information indicated that the line would in future be worked upon principles which have been tested by long experience in the United States and elsewhere, but which hitherto have not been regarded as applicable to this country. The next step by which the North-Eastern will secure the heavier loading of its trains and cars and reduction of train mileage has now been taken. The Company has decided to reorganise its traffic departments, to alter the methods of conducting business in these departments, and to redistribute the duties of the traffic managing staff.

The scheme for this reorganisation was devised some years ago, and arrangements have gradually

been made to prepare for its introduction. The final arrangements were made early in January 1902, when the directors sanctioned the new allocation of duties and the list of new appointments, all of which are filled up from the ranks of the existing staff of the Company.

The principle of the reorganisation is based on a separation of commercial work from the technical work of dealing with traffic.

Hitherto the goods department, inheriting a system which originated when railway working problems were less technical and perhaps less important than they have since become, has combined with its commercial work the supervision of the working, and of the staff at goods stations and terminal yards, including the loading and unloading and making up of goods trains, and the distribution of goods waggons.

The department of the superintendent of the line has been responsible for the running of goods trains and the operations connected with the working of these trains when in transit, *but the functions and authority of the superintendent have not extended within the terminal yards where goods traffic is received for carriage and loaded up, and where really the most vital part of the work affecting the economical handling and working of goods traffic is performed.*

Under the new organisation which is to be adopted

by the North-Eastern, the superintendent of the line becomes general superintendent, with extended authority. The commercial duties connected with passenger and coaching traffic, hitherto performed by the superintendent of the line, are transferred to a new department under a chief passenger agent. This relieves the general superintendent of a mass of office duties, which tend to withdraw his attention and energies from his main duty of handling and working promptly and economically the traffic which the Company has to carry. Similarly, all the duties connected with the working of traffic hitherto performed by the goods department are transferred to the general superintendent, while the commercial duties and the office work connected therewith are retained by the goods department.

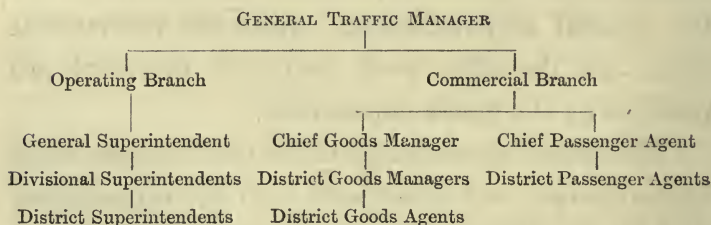
The general organisation of the traffic departments in the districts will correspond with the organisation at the head offices. The district superintendents, of whom there will be nine, will have complete and undivided control, each in his own district, of all working operations connected with all kinds of traffic, passenger, goods, minerals, docks, &c., while the district goods managers and district passenger agents will, in their respective districts, attend to the commercial part of the work.

To assist still further the proper performance of

R

the duties assigned to the department of the general superintendent, upon which the economical working of the railway so greatly depends, three new posts are created, namely, those of divisional superintendents, in one of which is merged an existing office of mineral manager in one district. These officers will each have charge of one section of the entire system, and will, under the general superintendent, exercise supervision by constant inspection over all the work of the district superintendents.

The general scheme of the new organisation is shown on the following chart :—



Thus the North-Eastern will now possess the statistical data and much the same organisation as the American lines, and doubtless will in future be able to effect economies in some measure corresponding to the remarkable savings which American railways have secured by loading their trains more and more heavily. We do not, of course, anticipate that English railways will ever obtain the enormous train loads of American lines, but, in comparison with

existing loads, the percentage improvement will probably be very great.

As we consider the reorganisation now effected of great importance to the proprietors of our railways, to traders, and to the general community, we publish below the list of traffic officers appointed under the new organisation :—

LIST OF TRAFFIC OFFICERS

	Post held previous to new appointment
<i>General Traffic Manager</i> . Mr. Philip Burt	No change
<i>Assistant Traffic Manager</i> . Mr. James Forsyth	No change

GENERAL SUPERINTENDENT'S DEPARTMENT

<i>General Superintendent</i> . Mr. H. A. Watson	Superintendent of the Line
<i>Assistant Superintendent</i> . Mr. George Hope	District Passenger Superintendent, Newcastle

Divisional Superintendents :—

Southern Division . . . Mr. J. B. Harper	District Passenger Superintendent, York
Northern Division . . . Mr. T. Pickering	District Goods Man- ager, Newcastle
Northern Division (Mineral Section) . . Mr. J. Fairless	Mineral Manager, Newcastle

District Superintendents :—

Darlington District . . Mr. H. M. Sinclair	Superintendents' De- partment
Hull District . . . Mr. J. Wolton	Assistant Goods Man- ager
Leeds District . . . Mr. W. Noble	Superintendent's De- partment
Middlesbrough District . Mr. R. L. Wedg- wood	General Traffic Man- ager's Staff
Newcastle District . . Mr. S. Holliday	Passenger Station Agent, Newcastle

LIST OF TRAFFIC OFFICERS—(continued)

District Superintendents (cont.) :—

		Post held previous to new appointment
Sunderland District . .	Mr. H. Carriek . .	Locomotive District Inspector
West Hartlepool District	Mr. R. Kirkup . .	Goods Agent, York
York (North) District .	Mr. T. H. Ellis . .	District Passenger Superintendent, Darlington
York (South) District .	Mr. C. A. Lambert	Superintendent's De- partment

CHIEF GOODS MANAGER'S DEPARTMENT

<i>Chief Goods Manager</i> . .	Mr. W. Robinson .	No change
<i>Assistant Goods Manager</i> .	Mr. E. Lake . . .	District Goods Man- ager, Hull

District Goods Managers :—

Darlington District . .	Mr. A. W. Wilson .	Same title
Hull District	Mr. A. E. Ballan .	Dock Superintendent, West Hartlepool
Leeds and York District	Mr. E. Storey . .	District Goods Man- ager, Leeds
Newcastle District . .	Mr. T. Chatt . . .	Dock Superintendent, Middlesbrough
West Hartlepool . . .	Mr. G. Nicholson .	Goods Agent, Mid- dlesbrough

CHIEF PASSENGER AGENT'S DEPARTMENT

<i>Chief Passenger Agent</i> . .	Mr. E. L. Davies .	District Passenger Superintendent, Hull
----------------------------------	--------------------	---

District Passenger Agents :—

Leeds District	Mr. W. R. Roden .	District Passenger Superintendent, Leeds
Newcastle District . .	Mr. E. F. Wilkin- son	Superintendent's De- partment

The nature of the duties allotted to the respective departments as now organised will doubtless be of much interest to the officials of other railways who are also endeavouring to increase the loading of their trains, and we consequently give the new departmental regulations of the North-Eastern.

DEPARTMENT OF THE GENERAL SUPERINTENDENT

The general superintendent is charged with the administration of the department of the Company's business connected with the running of trains and the handling and carriage of traffic of all kinds on the Company's railways, docks and wharves.

This department includes the following duties :—

1. Supervising the safe and proper working of the railway, stations, warehouses, yards, sidings, docks and traffic appliances.

2. Supervising the loading, unloading and handling of traffic.

3. Fixing the times and traffic arrangements for running all trains and supervising the running thereof.

4. Submitting proposals for the equipment required for trains and for works and accommodation required for traffic of all kinds.

5. Controlling the ordering-out of all locomotive engines for traffic purposes.

6. Controlling the train mileage run to carry the traffic.

7. Controlling the supply and distribution of carriages and waggons.

8. Preparing all time tables and time bills for issue to the public, and preparing, distributing, and issuing to the working staff all time tables, notices,

and instructions in connection with the working of the Company's railways and docks and the traffic thereon.

9. Examining and reporting on all applications from traders in connection with private sidings.

10. Dealing with claims under the Workmen's Compensation Act.

11. Supervising the use of the Company's telegraphs and telephones.

12. Enforcing the due and proper observation of all rules and regulations of the Company in connection with the working of the railway and docks and the traffic thereon.

DEPARTMENT OF THE CHIEF PASSENGER AGENT

The chief passenger agent is charged with the administration of the department of the Company's business connected with securing and charging for passenger traffic and all traffic carried by passenger trains usually known as coaching traffic, including fish carried under fish waybills.

This department includes the following duties :—

1. Fixing fares and rates for coaching traffic.

2. Preparing, printing and issuing tickets.

3. Canvassing for and securing excursion traffic and all coaching traffic, including supervision of the agencies and receiving offices for dealing with any of this business.

4. Preparing, distributing and issuing all advertisements in relation to coaching traffic, except ordinary time tables and time bills.

5. Distributing and issuing the public time tables prepared by the general superintendent.

6. Advising the general superintendent as to the train service required for the accommodation of the public.

7. Collecting charges for coaching traffic.

8. Collection and distribution of information as to trade movements and developments, and as to events of a public or private nature likely to affect the Company's coaching business, or to require special provision to be made therefor, and submitting proposals with reference thereto.

9. Supervision and control of booking and parcels offices, and of the collection and delivery of parcels traffic.

10. Dealing with all claims in connection with coaching traffic.

11. Supervision of trade advertising on Company's property.

DEPARTMENT OF THE CHIEF GOODS MANAGER

The chief goods manager is charged with the administration of the department of the Company's business connected with securing and charging for goods traffic, which expression as used herein

comprises merchandise, live stock and mineral traffic, except fish carried under fish waybills.

This department includes the following duties :—

1. Collection of information as to trade movements and developments and as to railway facilities required by traders and for goods traffic, and submitting proposals with reference thereto.

2. Fixing and quoting rates and charges for all services in connection with goods traffic and keeping all proper rate books.

3. Canvassing for and securing goods traffic.

4. Preparing and despatching invoices or obtaining declarations of all goods traffic loaded for carriage.

5. Collecting charges for goods traffic, except charges for certain mineral traffic collected by the accountant.

6. Advising the general superintendent as to the accommodation and train services required for goods traffic.

7. Supervision and control of goods agents and station masters in relation to their commercial duties in connection with goods traffic.

8. Dealing with all claims in connection with goods traffic.

9. Cartage of goods traffic, and supervision of cartage staff and plant.

10. Examining and reporting on all applications

from traders in connection with private sidings in regard to questions of rates or charges, and keeping records of all particulars in regard to private sidings.

11. Examining and reporting on all questions in regard to the routing of and division of receipts for through goods traffic.

12. Preparing and issuing notices as to carriage of live stock traffic in districts affected by cattle disease, and similar special notices affecting the carriage of any kind of goods traffic.

13. Dealing with the allotment of coal cells and supervising the coal cell agencies.

14. Controlling the supply, distribution, and repair of sacks provided by the Company for goods traffic.

CHAPTER XXIV

THE MANAGER OF THE NORTH STAFFORDSHIRE RAILWAY
ON THE VALUE OF TON MILEAGE STATISTICS

To the Editor of 'The Statist'

'SIR,—If the average rate per ton per mile for a gold watch, Geneva to Durham, is 1.241*d.* per ton per mile, at what rate will it pay to carry 10,000 tons of pig iron from Ferryhill to Elswick?!!!

'This is only an example in the dissimilarity in the quantities, articles, and conditions under which the hundreds of thousands of consignments of goods were carried between hundreds of different points by the North-Eastern Company during the month of May 1900 [1901], and an average receipt per ton per mile "concocted" from this medley is about as useful as it would be to know the average distance from the earth to the fixed stars without knowing the distance to any one of them. Surely also it is a *non sequitur* to argue that larger engines and trucks are economically necessary because the average train load is 44.18 tons, which can easily be carried in five of the existing 10-ton trucks, and drawn by the smallest engine the Company is possessed of.

‘No doubt in a limited number of cases, where there is a regular and heavy mineral traffic between points where such waggons can be accommodated, large waggons may be economically used, but the real difficulty the railway manager has to encounter is to find even moderately full loads for his existing waggons. No doubt there is a large traffic between the Staffordshire Potteries and London, but between how many stations in the Potteries and how many stations in London, and by how many competing routes, has it to be divided? necessitating many waggons, but each with a light load.

‘At the ironworks, at any rate, you will say there should be no difficulty in loading large trucks. Experience shows that the average truck load sent out is under 5 tons. During the latter part of the past century a great change has taken place in the conditions under which the inland trade of the country is carried on. When communication was slow and difficult, as it was when canals were the carriers, the merchant used to order his goods in heavy consignments, and keep large stocks, from which he supplied his customers, and in this slow-moving country it took the merchant many years to alter this practice. Now the merchant (the middleman) in most cases has nothing but his office—he has no warehouse, and keeps no stock. He knows exactly who are the manufacturers of all descriptions of articles in which

he deals, and when he gets an order he simply passes it on to the manufacturer, and expects him either to keep a stock or to manufacture at short notice what his customer has ordered from him; the natural result being that even from the largest manufacturers the usual course of business is, not large consignments, requiring large waggons, but endless small lots of goods, all requiring the promptest despatch in through trucks direct to destination.

‘The 12 and 15 ton “broad” gauge waggons were never replaced when the Great Western Railway converted their line into “narrow” gauge—probably their experience showed that they were not economical.

‘I am, Sir, your obedient servant,

‘W. D. PHILLIPPS.

‘North Staffordshire Railway, General Manager’s Office,
Stoke-upon-Trent: December 17, 1901.’

REPLY TO MR. PHILLIPPS

Mr. Phillipps refers to the average train load of the North-Eastern as 44·18 tons; this is only the average merchandise load, and merchandise represents but a small portion of the total tonnage. It will be noted that the greater portion of the letter is devoted to proving that merchandise traffic cannot be carried in larger waggon loads; but we would point out that of the North Staffordshire’s total traffic

of 5,587,000 tons, only 1,507,000 tons, or 27 per cent., is merchandise, and that as much as 4,080,000 tons, or 73 per cent., is minerals. It will be further noted that little is said concerning the loading of mineral trains *into* the iron, gas, and other works. In previous chapters we have answered Mr. Phillipps' objections. As to the importance of ton mileage, passenger mileage, train loads, and other figures, the General Manager of the North Staffordshire can be scarcely regarded as an authority, as he does not possess the data with respect to the traffic of his own Company, and consequently can know nothing of their utility. On the other hand, companies which compile the figures, and which have had a long experience of their usefulness, declare them to be of immense value, and their opinion is supported by their ability to work their roads with great economy. If Mr. Phillipps will compile the data indicated on page 69 and will put into practice the lessons he will learn from analysing the information, we are sure that his views will be modified, and we trust that he will then favour the readers of *The Statist* with the results of his experience.

CHAPTER XXV

THE LANCASHIRE AND YORKSHIRE RAILWAY

As its title signifies, this Company serves the counties of Lancashire and Yorkshire. Over a considerable section of Lancashire it has a monopoly of traffic, but in South Yorkshire its lines are more or less paralleled, and it serves a large portion of the district by means of running powers over the lines of other companies. The trend of its traffic lies chiefly west and east, its lines extending from Liverpool, Southport, Blackpool, and Fleetwood, on the west, to Goole on the east, with running powers to Hull and York. The Company enjoys a very large traffic between Liverpool and the cotton districts of Lancashire, it secures a considerable traffic to and from the woollen manufacturing districts of Yorkshire, and it has a large participation in the coal trade of both South Yorkshire and Lancashire, and in the other important manufacturing industries of both counties. Its prosperity consequently is more or less governed by the relative activity of the cotton, woollen, coal, iron, and machinery trades, and should foreign countries succeed in capturing

the trade in any of these products which has hitherto been enjoyed by this country, the Lancashire and Yorkshire would suffer in common with the people of Lancashire or Yorkshire. Firstly, it would transport less raw material and a smaller quantity of manufactured goods, and, secondly, it would suffer from the reduced spending capacity of the people. The great progress made by the industries of other countries in proportion to the development of our own in recent years, and the danger lest we may find ourselves unable to compete on equal terms in a period of depression, are, therefore, matters which closely concern the Company. In no industry is greater competition threatened than in the cotton trade, and no important industry has shown less growth in recent years in comparison with the development in other countries. The consumption of cotton by the spinners of Great Britain—which means Lancashire—in the past season was only 3,269,000 bales, as against 3,384,000 bales ten years ago, an actual diminution in ten years of 115,000 bales, or 3 per cent.; whereas the cotton consumed by the other countries of the world in the period rose from 6,959,000 bales in 1890–91 to 9,557,000 bales in 1900–1, a growth of 2,598,000, or 37 per cent. Nor is the outlook for the future much more pleasant. The Southern of the United States are rapidly increasing their output of manufactured

cotton goods, and are devoting their attention, among other things, to supplying China with cotton goods at a lower price than that at which it pays to make them in this country for that market. And the geographical advantages which America now has as regards its cotton trade with the Eastern markets will, in the not distant future, be enhanced by the construction of the Nicaraguan or Panama Canal. Further, the growth of the cotton industry in Japan, in India, and on the Continent in recent years has been very marked, and if this country is to hold its own the cost of production must be materially reduced, at the same time that the quality of the goods must be maintained or improved.

We do not, however, for one moment doubt that our manufacturers, our merchants, our workmen, the owners of our docks and of our railways, will do their utmost to maintain the high commercial position of this country. We believe, indeed, that they will not merely adopt the methods which have proved economical and profitable in other countries, but that they will more than make good the apparent disadvantage at which we now find ourselves. Indications of the desire to be at least on level terms with other countries are to be seen on every hand. In the cotton trade, manufacturers are already introducing improved machinery which will greatly reduce costs. In the iron trade, some of the more prominent

firms are considering—indeed, have already decided—to adopt American machinery and methods of manufacture. Our working men are beginning seriously to consider the unwisdom of their recent policy of restricting, instead of stimulating, the output of the individual; and our patent laws are being discussed, and are likely to be overhauled and amended. Indeed, on every hand there are signs that very great improvement in our methods of manufacture will be effected in the next few years. And not the least satisfactory sign is the movement among our railways to change their methods of working and to reduce the cost of transport. We have indicated the steps to this end taken by the London and North-Western, the Midland, the Great Western, and the North-Eastern. We shall now show the important measures taken by the Lancashire and Yorkshire, one of the first of our railways to realise the importance of the matter for effecting economies by loading trains and waggons more heavily. To this Company, indeed, belongs the credit of having first introduced upon our railways 30-ton merchandise waggons.

In previous chapters we have called attention to the change which the Company has made in its system of making up its goods trains, but, as the matter is important, we again quote the remarks of Sir George J. Armytage at the last half-yearly meeting. Referring to the reduction in freight-train

S

mileage effected, the chairman said: 'We have adopted a system under which such trains are made up to a tonnage basis equal to the haulage capacity of the engine, and not, as hitherto, upon a given number of waggons, which enables us to utilise our locomotive power to the fullest extent and to reduce the number of trains running over the system, thereby not only effecting a saving in running expenses, but relieving the congestion which prevails at many points on the line'; and Sir George added: 'It is principally to this that we must look for future economies.' As a result of the experiments made in the June half of 1901, the Company's freight-train mileage was reduced by 8·7 per cent., with a decrease in gross earnings of 3 per cent. Hence the earnings per train mile for the half-year increased no less than 6·2 per cent. The December half year's results will probably show a still greater reduction in train mileage.¹ On the section of the line between the South Yorkshire coalfields and Goole the Company during the past year has been running trains up to a gross load of 1,000 tons and a net load of 600 tons, whereas previously its maximum gross load on this section was about 700 tons and its maximum net load some 400 tons. Of course these

¹ The Company for the December half of 1901 has increased the loading of its freight trains by about 11 per cent., and an increase of 1·8 per cent. in its freight receipts has been attended by a reduction of 8·7 per cent. in its train mileage.

trains are run on a portion of the line where the gradients are comparatively easy. Nevertheless, there has been an endeavour to increase the loading of the lightest trains. We should mention that the saving in the return load of empty trucks has been remarkable. At times the engines on the Goole line have hauled as many as 170 empty trucks. The length of these trains has, however, been found to be somewhat inconvenient, and the number of empty trucks forming a load now rarely exceeds 120. The Company is building a number of 30-ton waggons, which, when they come to be generally adopted, will greatly reduce the length of the trains, and will add greatly to the paying load; and, as we have stated, the Company has already constructed a few 30-ton merchandise—not mineral—waggons, and the experience of a few weeks has shown them to be very economical. The Company is running the waggons between centres where such trucks can be used to advantage in the transport of wheat, wood-pulp, iron piping, &c.; and it has found that one large truck has accommodated traffic which otherwise would have needed as many as seven small trucks. When it is considered that the weight of a small truck is between 4 and 5 tons, and that the weight of the 30-ton waggon is only 14 tons 18 cwt. 2 qrs., the saving in dead weight will be appreciated.

The dimensions of the new 30-ton 'bogie'

waggons which have been built at the Lancashire and Yorkshire's own waggon works at Newton Heath are as follows :—

Some Leading Dimensions

Carrying capacity	. . . . .	30 tons
Length	. . . . .	40 feet
Width	. . . . .	8 "
Depth	. . . . .	4 "
Wheel-base of bogies	. . . . .	5 feet 6 inches
Tare weight	. . . . .	14 tons 18 cwt. 2 qrs.
Paying load per cent. of gross weight.	. . . . .	67
Tare weight per cent. of gross weight.	. . . . .	33
Tare weight per cent. of paying load .	. . . . .	49.2

For the new waggons to be used to advantage a close knowledge of the quantity and description of traffic passing between various stations will, of course, be necessary. But there can be little doubt that a large number of these heavy goods waggons can be used. The experiments of the Lancashire and Yorkshire in this matter will undoubtedly be watched with keen interest by other lines. Beyond the measures taken to grade the engines according to their capacity and the construction of larger trucks, the Company recently commissioned its traffic manager, Mr. C. W. Bayley, to proceed to the United States to report upon any improvements that may be adopted with advantage. Mr. Bayley—who, with the general manager of the Company, Mr. J. A. F. Aspinall, is in full sympathy with the movement for improved method of working in all its forms—has obtained much valuable information, which will

assist the Company in working the system on the economical principles which have proved so profitable to American railways and so advantageous to American trade.

As the management, the directors, and the chairman of the Company have already given clear indication of their intention to try any new method of working which has been found to be advantageous in other countries, we do not doubt that a very great increase in the Company's train loads will be brought about, and important economies result. In this movement they will be assisted by the nature of the traffic.

The weight of the freight traffic for the twelve months to June 30, 1901, was 21,306,000 tons. Of this amount 11,754,000 tons, or 55 per cent., consisted of coal and coke; 3,240,000 tons, or 15 per cent., was other minerals; and 6,311,000 tons, or 30 per cent., was general merchandise. Of the general merchandise a considerable proportion consisted of wheat and cotton, carried in large quantities. Below we set out the tonnage of coal and coke, other minerals, the total minerals, the quantity of merchandise, and of the total freight for the twelve months to June 30, 1901:—

	Tons	Per cent. of total
Coal and coke	11,753,973	55
Other minerals	3,240,747	15
Total minerals	14,994,720	70
Merchandise	6,311,981	30
Total freight	21,306,701	100

THE GOODS TRAFFIC

Owing in a large measure to the very considerable reduction in train mileage in the six months to June 30 last, the freight-train load, as gauged by the average receipts per freight train per mile, shows marked improvement compared with the average receipts per train mile in 1896. The increase would, indeed, have been greater had the Company not suffered from some decline in its freight earnings. As it is, however, an increase of 6·1 per cent. in the earnings of its freight trains since 1896 has been attended by a diminution of 1·4 per cent. in the mileage of freight trains and an increase of 7·5 per cent. in the receipts per freight-train mile. Below we set out the earnings and mileage of freight trains and the receipts of freight trains per mile in the twelve months to June 30 last, for the previous twelve months, and for 1896 :—

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
				£	%
Earnings of freight trains	£ 2,948,000	£ 3,005,000	£ 2,779,000	+ 169,000	+ 6·1
Mileage of freight trains	6,262,000	6,682,000	6,352,000	— 90,000	— 1·4
Receipts of freight trains per mile . . .	112·97d.	107·93d.	105·00d.	+ 7·97d.	+ 7·5

From the above it will be noted that the Company's receipts per freight-train mile were no less than

112·97*d.*, whereas those of the North-Western were 82·2*d.*, of the Midland only 65·7*d.*, of the Great Western 60·4*d.*, and of the North-Eastern 82·65*d.* That its receipts per freight-train mile are so large in comparison with the other lines is due, firstly, to the shortness of its haul, and the consequent large percentage of its receipts for terminal charges in proportion to its conveyance charges; secondly, to its large and profitable cotton traffic; and, thirdly, to its somewhat larger train loads. The increase of 6 per cent. in the Company's freight traffic since 1896 is relatively small, owing doubtless to the fact that the cotton industry has in proportion to other industries been much less prosperous, and that the woollen trade has not been particularly flourishing. The following is a contrast of the receipts from merchandise, live stock, and minerals for the twelve months to June 30, 1901 and 1900, and for 1896:—

Revenue from Freight Traffic

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
	£	£	£	£	%
Merchandise . . .	1,814,000	1,852,000	1,734,000	+ 80,000	+ 4·61
Live stock . . .	38,000	39,000	41,000	— 3,000	— 7·31
Minerals . . .	1,096,000	1,114,000	1,004,000	+ 92,000	+ 9·16
Total . . .	2,948,000	3,005,000	2,779,000	+ 169,000	+ 6·08

Careful estimates indicate that the Company's average rate per ton per mile for merchandise traffic is 2·73*d.*, for live stock 3·60*d.*, and for mineral ·93*d.* On this basis we set out below the merchandise, live stock, mineral, and total ton mileage for the twelve months to June 30, 1901 :—

Freight Receipts, Rates per ton per Mile, and Ton Mileage

Twelve months to June 30, 1901	Receipts	Rate per ton per mile	Ton miles
	£	d.	
Merchandise . . .	1,814,000	2·73	159,465,000
Live stock . . .	38,000	3·60	2,533,000
Minerals . . .	1,096,000	·93	282,839,000
Total freight .	2,948,000	1·568	444,837,000

Thus the tons carried one mile in the twelve months to June 30 last were 444,837,000, and these were carried in 6,262,000 train miles. The average train load was consequently 71 tons. As the tonnage moved, exclusive of live stock, was 21,307,000 tons, and as the tons carried one mile, exclusive of live-stock mileage, were 442,304,000, it follows that the average length of haul was only 20·7 miles, as against the North-Eastern's short haul of 22·23 miles and the North-Western's estimated average haul of 34·8 miles. We set out the approximate ton and train mileage, the train load, the tonnage moved, the average haul, the earnings of goods trains, the

average rate per ton per mile, and the earnings per ton per mile for the twelve months to June 30 last :—

Freight Trains

Tons carried one mile	444,837,000
Train mileage	6,262,000
Train load	71 tons
Tonnage moved	21,306,701
Average haul	20·7 miles
Earnings	£2,948,000
Average rate per ton per mile	1·568d.
Earnings per freight-train mile	112·97d.

The average load of 71 tons would appear to be made up of an average load of minerals of about 90 tons and an average load of merchandise and live stock of a little under 52 tons.

To give an approximate idea of the average loads of merchandise and minerals, as well as the total average loads of freight trains (including empty trains), we give the following :—

—	Tons carried one mile	Train miles	Average load
Merchandise and live stock	161,998,000	3,119,000	51·9
Minerals	282,839,000	3,143,000	90·0
Total freight	444,837,000	6,262,000	71·0

How this estimated load compares with the actual loads of the North-Eastern and the estimated loads of the London and North-Western, Midland, and Great Western, will be seen from table given on the next page.

Average Train Loads, Twelve Months to June 30, 1901

	Total tons
Lancashire and Yorkshire (estimated)	71
North-Eastern (actual)	67·7
London and North-Western (estimated)	69
Midland (estimated)	58
Great Western (estimated)	57

That the reader may appreciate the advantage of the train load as a barometer of economical working compared with the freight-train mile receipts, which hitherto have been regarded as the indicator by English railways, we set out the receipts per train mile of the Lancashire and Yorkshire and of the four other Companies mentioned :—

Receipts per Freight-train Mile

	d.
Lancashire and Yorkshire	112·97
North-Eastern	82·65
London and North-Western	82·2
Midland	65·7
Great Western	60·4

The loading of the Lancashire and Yorkshire per train mile is thus 3 per cent. greater than the North-Western's and 5 per cent. better than the North-Eastern's, whereas on the 'receipts per train mile' basis the loading superficially looks to be 37 per cent. greater than the North-Western's and 36 per cent. greater than the North-Eastern's. As an indication of the loading of trains, and of the economy of working which results from heavy loading, it will consequently be evident that the receipts per train mile are misleading. The only accurate method of ascertaining

the loading of trains is by taking out the ton mileage and dividing into it the train mileage. In this way the difficulty of an accurate comparison which arises from the differences in the length of haul and in the rates charged is eliminated. As far as it can be ascertained from a careful estimate of the average rate per ton per mile secured, the Company's loading is better than that of such ably administered lines as the North-Western and North-Eastern, and, in view of the measures it is now taking to build larger waggons and to haul heavier trains, it is evident that its management will endeavour to maintain its title to be called the Company which loads its freight trains the more heavily and works with a minimum of freight-train mileage.

The Lancashire and Yorkshire has greatly improved its passenger service in recent years. Although it has recently taken off a number of unnecessary trains, its loading of passenger trains for the twelve months to June 30 last was somewhat less than that of 1896. An increase of 12·1 per cent. in passenger earnings since 1896 was attended by an increase of 14·9 per cent. in the mileage of passenger trains, and a diminution of 2·5 per cent. in the receipts per passenger-train mile.

On page 284 we contrast the earnings and mileage of passenger trains with the receipts of passenger trains per mile in the past two years and in 1896.

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
					%
Earnings of passenger trains .	£2,308,000	£2,278,000	£2,059,000	+ £249,000	+ 12·1
Mileage of passenger trains .	12,330,000	12,250,000	10,727,000	+ 1,603,000	+ 14·9
Receipts of passenger trains per mile .	44·90d.	44·62d.	46·05d.	— 1·15d.	— 2·5

The improvement of 12 per cent. in the receipts from passenger trains shown above has been chiefly in second class passengers, an increase of no less than 217 per cent. in second class passenger receipts since 1896 having resulted from the reduction in second class fares which was initiated on July 1, 1897. The improvement in the third-class receipts has been under 5 per cent. The season ticket receipts show the satisfactory increase of over 16 per cent., and the receipts from parcels, horses, &c., an expansion of over 15 per cent. On the other hand, the lower fares for second class passengers have still further reduced the number of first class passengers, and the receipts from first class passengers have declined nearly 8 per cent. since 1896.

To show the growth in receipts from the various classes of passenger traffic and the decline in first class receipts since 1896 we give the following contrast.

To ascertain the Company's passenger mileage we have estimated its receipts from first class passengers

Receipts of Passenger Trains

—	1900-1	1899-1900	1896	Increase or Decrease 1900-1 compared with 1896	
	£	£	£	£	%
First class .	59,000	61,000	64,000	— 5,000	— 7·81
Second class .	168,000	152,000	53,000	+ 115,000	+ 216·98
Third class .	1,576,000	1,572,000	1,504,000	+ 72,000	+ 4·78
Season tickets .	255,000	249,000	219,000	+ 36,000	+ 16·43
Parcels, horses, &c. . .	232,000	226,000	201,000	+ 31,000	+ 15·42
Mails . .	18,000	18,000	18,000	—	—
Total . .	2,308,000	2,278,000	2,059,000	+ 249,000	+ 12·09

at 1·6*d.* per mile, for second class passengers at 1*d.* per mile, for third class passengers at ·75*d.* per mile, and for season tickets at ·35*d.* per passenger per mile. We show below the number of passengers carried, the receipts, the rate per passenger per mile, and the number of passengers carried one mile in the twelve months to June 30, 1901 :—

*Number of Passengers, Receipts, Rate per Passenger, and
Passenger Mileage*

Year to June 30, 1901	Number of Passengers	Receipts	Rate per passenger per mile	Number of passengers carried one mile
		£	<i>d.</i>	
First class . .	928,853	59,000	1·6	8,906,000
Second class . .	4,110,892	168,000	1·0	40,343,000
Third class . .	58,606,101	1,576,000	·75	504,334,000
Season tickets . .	52,702	255,000	·33	185,453,000
Total . .	63,698,554	2,058,000	·667	739,036,000

To arrive at the average rate for season tickets we have estimated the receipts from first class tickets at $\cdot42d.$, from second class at $\cdot35d.$, and from third class at $\cdot27d.$ per passenger per mile. The estimated passenger miles of season ticket holders in 1900 were as follows :—

Season Ticket Receipts, 1900

—	—		Passenger miles
	£	d.	
First class	108,739	·42	62,114,000
Second class	37,525	·35	25,730,000
Third class	105,283	·27	93,593,000
Total	251,547	·33	181,437,000

To move these 739,036,000 passengers one mile 12,330,000 train miles were run, and the average number of passengers per train was 59·93. The approximate numbers of first, second, and third class passengers carried in each train are as follows :—

Average Passenger Train Loads

Passengers per train	Ordinary tickets	Season tickets	Total
	No.	No.	No.
First class	·72	5·13	5·85
Second class	3·27	2·15	5·42
Third class	40·90	7·76	48·66
Total	44·89	15·04	59·93

Considering that the Company's average receipts

per first class passenger per mile is still 1·6*d.*, and that the number of first class passengers per train travelling by ordinary ticket is less than 1—only ·75—would it not be advisable and profitable to reduce the first class fares somewhat in proportion to the reduction which has already been so advantageous in building up a large second class passenger traffic? This remark applies not merely to the Lancashire and Yorkshire, but to other companies whose profits from first class passengers are not what they would probably be were they to charge less prohibitive fares and to carry a much larger number of first class passengers per train. To give some idea of the enormous percentage growth in the number of passengers who have availed themselves of the second class, now that the fare is only moderately above the third class fare, we set out the passenger-train mileage of the various descriptions for the twelve months to June 30, 1901, in contrast with 1896. The figures are based upon the same average receipts per passenger per mile in the two years for the first and third classes and season tickets, and as regards the second class upon an average rate of 1*d.* per mile for the past twelve months and of 1·2*d.* per mile for 1896.

It will be noted that the Company has increased its passenger-train mileage in somewhat greater proportion than the growth in the number of passengers.

Passengers Carried One Mile

—	1901	1896	Increase or Decrease	
	No.	No.	No.	%
First class . .	8,906,000	9,600,000	— 694,000	— 7·23
Second class . .	40,343,000	10,600,000	+ 29,743,000	+ 280·56
Third class . .	504,334,000	481,272,000	+ 23,062,000	+ 4·79
Season tickets . .	185,453,000	159,264,000	+ 26,189,000	+ 16·45
Total	739,036,000	660,736,000	+ 78,300,000	+ 11·85
Train mileage . .	12,330,000	10,727,000	+ 1,603,000	+ 1·49
Train load (number)	59·9	61·6	— 1·7	— 1·7

Below we summarise the results of the passenger-train working:—

Passenger-train Results.

Passenger mileage	739,036,000
Train mileage	12,330,000
Number of passengers per train mile	59·93
Average rate per passenger per mile	·667d.
Passenger earnings	£2,058,000
„ „ per train mile	40·05d.
Total earnings of passenger trains	£2,308,000
„ „ per train mile	44·90d.

In view of the efforts which the Company is making to increase its loading of both goods and passenger trains, a very considerable reduction in train mileage will be immediately effected. And in course of time, as works and docks are adapted to the use of the larger waggons, the average freight-train load secured will show further marked expansion. In previous articles we have indicated that an improvement in the average freight-train loads of our railways of something like 50 per cent. can be

reasonably anticipated, and it seems probable that the Lancashire and Yorkshire will ultimately increase its train loads by this, and possibly by a greater extent. Indeed, the Company seems likely to be one of the most successful of our railways in building up larger train loads and in working with great economy.

Apart from the great saving in expenditure which will ultimately be effected by increasing the train loads and reducing the train mileage, the Company will, of course, immediately benefit from the fall in the price of fuel and material. To give an idea of the effect upon the Company's expenditure of the increase in wages and the higher prices paid for material, coal, &c., we contrast the expenditure for these purposes, together with the total expenses, the gross earnings, the ratio of expenses to gross earnings, and the total train mileage, for the twelve months to June 30, 1901 and 1900, and for the calendar year 1896.

On page 290 we have set out separately the sums spent upon renewals. The Company does not divide the amounts it spends upon renewals of engines, carriages, and waggons, into wages and materials, but devotes proportions of certain fixed amounts for these purposes. To obtain an idea of the growth in the expenditure upon wages and material the outlays for renewals must,

T

Expenditure on Wages, Material, Coal, &c.

—	1900-1	1899-1900	1896	Increase 1900-1 compared with 1896	
				£	%
Wages . .	£ 1,548,000	£ 1,561,000	£ 1,356,000	192,000	14·16
Material . .	191,000	178,000	163,000	28,000	11·04
Renewals ¹ . .	150,000	135,000	110,000	40,000	36·36
Locomotive coal	363,000	260,000	159,000	204,000	128·30
Other . .	1,053,000	1,013,000	908,000	145,000	15·96
Total expenses	3,305,000	3,147,000	2,696,000	609,000	22·59
Gross earnings	5,355,000	5,390,000	4,906,000	442,000	9·15
Ratio . .	(61·71)	(58·38)	(54·95)	(6·76)	12·30
Train mileage	18,592,000	18,932,000	17,079,000	1,513,000	8·85

¹ Proportions of fixed amounts for renewals of engines, carriages, and waggons.

however, be taken into account. The increase in the sums spent upon materials for repairs in 1900-1, compared with 1896, was only 11 per cent., or not much more than the increase in train mileage, but the sum spent upon renewals of rolling stock has increased over 36 per cent., and it is evident that the Company has been spending a good deal of money out of revenue upon new rolling stock. The Company, indeed, pursues the same policy as the North-Eastern and other well-managed lines in charging to revenue the whole cost of heavier rails, more powerful engines, and greater-capacity waggons, procured to replace lighter rails and rolling stock. Now that prices of coal and material have fallen, the Company's

expenditure has already been considerably reduced. Further, with the trade depression increasing, prices as low as those quoted in 1896 may be again witnessed, and shrinkage in gross earnings may be attended by a very considerable reduction in expenditure. So far as wages are concerned, no reduction can be anticipated other than that which will be effected by reduced train mileage.

To show what would have been the increase in expenses in the twelve months to June 30 last had the Company's expenditure for coal, material, and renewals of rolling stock, &c., only grown in proportion to the increase in gross earnings, we give the following in contrast with the actual expenditure in 1896:—

—	1900-1 at 1896 Prices	1896	Increase	
	£	£	£	%
Gross earnings . . .	5,355,000	4,906,000	449,000	9·15
Expenditure—				
Wages	1,548,000	1,356,000	192,000	14·16
Material	178,000	163,000	15,000	9·15
Renewals of rolling stock	120,000	110,000	10,000	9·15
Coal for locomotives .	173,000	159,000	14,000	9·15
Other	991,000	908,000	83,000	9·15
Total expenses . . .	3,010,000	2,696,000	314,000	11·64
Ratio to gross earnings .	(52·60)	(56·20)	(1·25)	—
Net earnings	2,345,000	2,210,000	135,000	6·10

Having thus approximately ascertained to what extent the expenditure of the year to June 30, 1901, was affected by the high prices of coal and material as compared with 1896, we can now roughly indicate the saving in expenditure which will occur when prices fall back to the 1896 level. We set out the calculation below :—

—	1900-1 at 1896 Prices	Actual, 1900-1	Increase or Decrease	
			£	%
Gross earnings . . .	£ 5,355,000	£ 5,355,000	—	—
Expenses—				
Wages	1,548,000	1,548,000	—	—
Material	178,000	191,000	— 13,000	— 6·80
Renewals of rolling stock	120,000	150,000	— 30,000	— 20·00
Locomotive coal . . .	173,000	363,000	— 190,000	— 52·34
Other expenses . . .	991,000	1,053,000	— 62,000	— 5·88
Total expenses . . .	3,010,000	3,305,000	— 295,000	— 8·92
Net earnings	2,345,000	2,035,000	+ 295,000	— 14·34

Thus, were the Company's gross earnings to be maintained at their level for the twelve months to June 30, 1901, and were prices to fall back to the 1896 level, its net earnings would be increased by 295,000/_. In other words, the gross earnings could decline by nearly 6 per cent. before the net earnings would fall beneath those for the twelve months to June 30 last. Really the loss in gross earnings could be greater before the net earnings fell beneath those

of the past twelve months, as the Company will not only derive advantage from the fall in prices, but reduced earnings and smaller traffic will mean reduced train mileage, apart altogether from the saving in train mileage likely to be effected by the improved methods of working. We have during the past few weeks indicated that the loss in the gross earnings of the North-Western, the Great Western, the Midland, and the North-Eastern through the growing trade depression may be somewhat serious. These four companies have greatly benefited from the enormous quantities of coal and minerals they have transported, and from the unusually great spending capacity of the employers and employes in the coal-mining and iron-manufacturing districts. Now that this unusual prosperity has passed, and prices and wages are falling, the effect upon the earnings of the railways mentioned must be appreciable. The growth in the earnings of the Lancashire and Yorkshire since 1896 has, however, not been abnormally great, the increase in its traffic having been only 9·15 per cent., against the 12 per cent. growth in the North-Western receipts, the 15·69 per cent. increase in the receipts of the Midland, the 16·37 per cent. increase in the earnings of the Great Western, and the expansion of 18·54 in the receipts of the North-Eastern. To show how relatively small has been the increase in the earnings of the Lancashire

and Yorkshire in contrast with the growth of the other four companies, we contrast below their earnings for the twelve months to June 30, 1901, and for 1896.

Gross Earnings, 1900-1 and 1896

—	1900-1	1896	Increase	
	£	£	£	%
Lancashire and Yorkshire .	5,355,000	4,906,000	449,000	9·15
North-Western . . .	13,812,000	12,319,000	1,493,000	12·12
Midland	11,057,000	9,553,000	1,499,000	15·69
Great Western . . .	11,181,000	9,608,000	1,573,000	16·37
North-Eastern . . .	9,173,000	7,738,000	1,435,000	18·54

That the Lancashire and Yorkshire earnings have not expanded to an extent corresponding to that of the other companies is due to the cotton trade not having been abnormally flourishing and the spending capacity of Lancashire not having grown in proportion to that of other districts where trade has been unusually good. This means that when the exceptional trade activity passes away there will be less likelihood of the Lancashire and Yorkshire receipts falling as heavily as those of the other companies. Consequently we anticipate that, should trade have a severe set-back, the Lancashire and Yorkshire will be able to maintain its net earnings at least at last year's, and probably at a higher, level. To show the level to which the Company's earnings, profits and dividends declined in the twelve months to June 30, 1901, as compared with the previous twelve months and with 1896, we give the following:—

—	1900-1	1899-1900	1896
Average mileage . . .	558 $\frac{1}{4}$	558	530 $\frac{1}{4}$
	£	£	£
Gross earnings . . .	5,355,000	5,390,000	4,906,000
Expenses	3,305,000	3,147,000	2,696,000
Ratio	(61·71)	(58·38)	(54·95)
Net earnings	2,050,000	2,243,000	2,210,000
Miscellaneous income .	3,000	13,000	3,000
Net income	2,053,000	2,256,000	2,213,000
Interest on Debenture stock	537,000	530,000	508,000
Rentals, &c. . . .	6,000	5,000	—
General interest, &c. .	21,000	18,000	12,000
Total charges	564,000	553,000	520,000
Profit	1,489,000	1,703,000	1,693,000
Dividend on Guaranteed and Preference stocks .	883,000	865,000	793,000
Profit for Ordinary . .	606,000	838,000	900,000
Dividend	(3 $\frac{5}{8}$ %) 607,000	(5%) 837,000	(5 $\frac{3}{8}$ %) 900,000
Balance	Dr. 1,000	Cr. 1,000	—
Brought forward . . .	23,000	22,000	29,000
Carried forward . . .	22,000	23,000	29,000
Capital expended . . .	54,663,000	53,440,000	50,226,000
Ordinary stock	16,740,000	16,740,000	16,740,000

The lowest dividends paid by the Company since 1872 have been $3\frac{1}{4}$ per cent., distributed in the depression of 1885, and $3\frac{1}{8}$ per cent. in 1893, when the coal strike temporarily affected the results. The distribution for the twelve months to June 30 last of $3\frac{5}{8}$ per cent. is thus near to the minimum. To show the dividends distributed since 1872 we give the annexed total.

Year	Per cent.	Year	Per cent.	Year	Per cent.
1900-1	$3\frac{5}{8}$ ¹	1891	$3\frac{7}{8}$	1881	5
1900	$4\frac{3}{8}$	1890	$4\frac{1}{4}$	1880	$5\frac{3}{8}$
1899	$5\frac{1}{4}$	1889	$4\frac{1}{2}$	1879	$4\frac{5}{8}$
1898	$5\frac{1}{4}$	1888	$4\frac{1}{8}$	1878	$5\frac{3}{8}$
1897	$5\frac{1}{8}$	1887	$4\frac{1}{4}$	1877	$6\frac{1}{8}$
1896	$5\frac{3}{8}$	1886	$3\frac{1}{2}$	1876	$5\frac{7}{8}$
1895	$4\frac{1}{2}$	1885	$3\frac{1}{4}$	1875	6
1894	$3\frac{1}{2}$	1884	$4\frac{1}{4}$	1874	$6\frac{1}{4}$
1893	$3\frac{1}{8}$	1883	$4\frac{3}{8}$	1873	$7\frac{1}{8}$
1892	$3\frac{9}{16}$	1882	$4\frac{7}{8}$	1872	$8\frac{3}{8}$

¹ The dividend for the year ended December 31, 1901, was $3\frac{3}{4}$ per cent.

Beneath we set out the amounts and prices of and the yields afforded by the Company's securities:—

—	Amounts June 30, 1901	Price Feb. 5, 1902	Interest and dividends	Yields
	£			£ s. d.
3 % Debenture stock . . .	18,282,287	101 $\frac{1}{2}$	3	2 19 5
Preference stock, 6 % minimum	288,375	187 $\frac{1}{2}$	6	3 5 0
Preference stock, 4 $\frac{1}{2}$ % minimum	100,000	—	—	—
Consolidated Guaranteed, 4 %	2,596,012	133 $\frac{1}{2}$	4	3 0 10
Consolidated Preference, 3 %	22,676,900	97 $\frac{1}{2}$	3	3 2 6
Preference stock, 1897, 3 %	1,446,000	95 $\frac{1}{2}$	3	3 3 10
„ „ 1899, 3 %	1,278,000	94 $\frac{1}{2}$	3	3 4 6
Consolidated stock . . .	16,740,995	113	3 $\frac{3}{4}$ ²	3 7 9
Total, June 30, 1901 .	63,408,569	—	—	—
New Ordinary	1,650,000 ²	—	—	—
Total	65,058,569			

¹ Dividend year ended December 31, 1901.

² 50 % paid January 1, 1902 ; 50 % to be paid July 1, 1902.

CHAPTER XXVI

INDIAN RAILWAYS AND TRAIN LOADS—THEIR EXPERIENCE
OF THE VALUE OF TON MILEAGE

IN replying to the General Manager of the North Staffordshire Railway as to the value of ton mileage, passenger mileage, train load and other figures, we stated that 'Companies which compile the figures and which have had a long experience of their usefulness declare them to be of immense value, and their opinion is supported by their ability to work their roads with great economy.' In making this statement we had in mind the declarations of some of the most prominent railway men in the United States, and the great economies which have in recent years been effected by the railways of that country. But experience of the value of ton mileage, passenger mileage, train load and car load figures is, as we have frequently pointed out, not confined to the United States. How highly these figures are regarded by Indian railway companies is shown by a note which the Chairman of the East Indian Railway Company, Lieutenant-General Sir Richard Strachey,

R.E., G.C.S.I., has added to the speech he delivered at the half-yearly meeting held on December 18 last. As the matter is of so much importance we reproduce the note which Sir Richard Strachey has drawn up, with the assistance of Sir Alexander Rendel, the consulting engineer of the Company:—

*‘ Note on the bearing of accurate statistics of working
on the economical management of Railways*

‘ The *Times* of the 14th December, quoting from *The Statist* of the same date, which has a long article on the subject, announces, on the authority of the general manager of the great railway system known as the North-Eastern Railway of England, as though it was something remarkable, that its managers have determined to adopt what *The Statist* calls the American system of ton and passenger mileage returns. It tells us also, on the same authority, what, I think, will startle some persons—that the average train loads on the North-Eastern system during the year 1900 were, in round numbers, in passenger trains only 62·4 persons, in merchandise trains only 44 tons, in mineral trains only 92½ tons, or in merchandise and minerals taken together 66·6 tons; and that the average rates charged were, for passengers 617*d.* per mile, for merchandise 1·64*d.* per ton per mile, and for minerals 1*d.* per ton per mile—or, taking merchandise, live stock and minerals

together, 1·24*d.* per ton per mile—and there is no reason to suppose that the train loads and charges on other great English lines differ materially from those of the North-Eastern.

‘Managers of Indian railways will fully understand from these figures how it is that English companies, with their constant increases of capital expenditure, in working expenses and in the ratio of expenses to receipts, and in demands made on them for reduction of rates, are beginning to find themselves on the edge of a precipice, with the greater part at least of the dividends on their ordinary stocks in jeopardy.

‘But they might also say that the discovery of the value of ton and passenger mileage returns comes more than a little late, and that to speak of it as an American practice implies a curious ignorance that the practice was adopted more than 30 years ago under the orders of the Government of India by all Indian railways, and its results for at least 25 years have been widely disseminated in innumerable copies of Indian half-yearly reports, many of which must, at some time or other, have been in the hands of the bulk of the managers and directors of English railways, if only because many of them hold Indian Railway Stocks.

‘The present seems therefore a suitable occasion for stating the reasons which led to the adoption of

these returns in India, and the results which have followed their introduction. I shall confine myself to the East Indian Railway, which took and has kept the lead in the matter from the first.

‘In the year 1867, thirteen years after the opening of the line, the Board of the East Indian Railway found themselves in a very serious condition. Their capital expenditure had long passed all expectations, demands for fresh and heavy expenditure were reaching them almost by every mail, their working expenses were high, and their traffic was disappointingly small. It was felt that something must be done, and it was finally determined to despatch the gentleman who was then, and still is, their consulting engineer—Mr. as he was then, now Sir Alexander Rendel—to India to consult with the Company’s officers there generally on the subject.

‘I was then Secretary of the Public Works Department of India, and naturally I saw a great deal of Mr. Rendel. Of the result of his visit in respect to capital expenditure I need say nothing here except that it was highly successful. But by far the more important result—for, in fact, the usefulness of the line to India, as well as its financial success, has been determined by it—was that our many conversations on the subject led to this conclusion: that nothing of value could be effected on Indian lines until their traffics were stated in ton and passenger

mileage. My own recollections of the details of our discussions are, from lapse of time, getting hazy ; but Sir Alexander Rendel tells me that he well remembers how, when he expressed a doubt whether the companies could be induced to prepare the necessary statements, I declared that "it could be done and should be done"—and somehow or other done it was at once. That decision was come to in the early part of 1868. Of course, it took some little time to set things in motion ; but very early in the seventies Sir Julian Danvers, then the Government Director of Indian Railway Companies, published, in his annual Report to the Secretary of State, a note by Mr. Rendel on the subject ; and in 1874 the East Indian Railway Board took the matter up by publishing in their report for the second half of 1873 the statement (the form of which will be seen on page 303) then and long after known as Mr. Rendel's statement, for the second halves of 1871, 1872 and 1873. This continued to the time when the Government of India took over from Sir Julian Danvers the duty of preparing the annual report on Indian railways, and developed their statistics into the perhaps over-elaborate form in which they are now drawn up. The Board from that time attached to their half-yearly reports, and still do so, a copy of so much of the Government statistics as included the more simple statement of their earlier reports.

‘It has, moreover, become the established practice to place, week by week, before the official meetings, at which are present the Agent and heads of departments, including the Chief Auditor, as well as the Government Consulting Engineer and Examiner of Accounts, a statement containing the principal results of the working, so that the whole of the officers concerned in the management of the traffic are kept continually informed of the progress made, and immediate attention is directed to any falling-off or improvement in the train and waggon loads, as well as to the increases and decreases of the traffic of all descriptions and the receipts from it.

‘The practical results of this system, the influence of which on the administrative staff extends also to the Board of Directors, to whom these weekly statements are regularly submitted, may be gathered from the annexed comparison of the traffic of the line for the first half of 1872, before the new statistics had produced much, though still some result, with that of the first half of 1901—when they have been acted on for more than 30 years. I take for the former period what was then known as the main line. I omit the Jubbulpore line, the accounts of which were at that time stated separately, because it was then but new, and its union with the main line would lead to unduly unfavourable conclusions. I convert also rupees from their standard value in 1872 of 1*s.* 10*d.* to their present price of 1*s.* 4*d.*, and

I take a passenger-train mile in both cases as costing the same as a goods-train mile, and compute the cost per train mile in the same way as in 1872.

‘ We have then the following :—

‘ Passenger Traffic

	1st half 1872	1st half 1901
Miles open	1,281	2,136
(1) Average receipts from each passenger train per mile	5s. 1·3d.	4s. 8·8d.
(2) Average sum received for carrying a passenger (taking all classes together) one mile	·27d.	·223d.
(3) Average number in any passenger train at any one time	235	257
(4) Average cost of running a train one mile	2s. 3¼d.	1s. 10¾d.
(5) Average cost of carrying a passenger one mile	·112d.	·088d.
(6) Average profit on each passenger per mile	·158d.	·135d.
(7) Average number of passenger trains running over each mile of line each way per diem (supposing all trains to run over the whole line in operation)	2·25	3·91
(8) Average number of passengers passing over each mile of line both ways per diem	1,064	2,010

‘ Goods Traffic (including Minerals)

	1st half 1872	1st half 1901
Miles open	1,281	2,136
(1) Average receipts from each goods train per mile	7s. 6d.	6s. 4d.
(2) Average sum received for carrying one ton of goods (taking all classes together) one mile	·789d.	·377d.
	·49d. merchandise ·29d. minerals	
(3) Average load in tons in any goods train at any one time	113·75	201·59
(4) Average cost of running a train one mile	2s. 3¼d.	1s. 10¾d.
(5) Average cost of carrying a ton of goods one mile	·238d.	·112d.
(6) Average profit on each ton per mile	·551d.	·265d.
(7) Average number of goods trains running over each mile of line each way per diem (supposing all trains to run over the whole line in operation)	3·68	7
(8) Average number of tons passing over each mile of line both ways per diem	833·5	2,820

‘The main features of this comparison are :—

‘(1) The great increase of the average daily number of passengers and tons of goods passing over each line of railway, being for the former 100 per cent. and for the latter nearly 250 per cent., while the mileage worked has increased more than 50 per cent.

‘(2) The increased train load of goods, which has been nearly doubled.

‘(3) The reduced charge for goods, the average now being considerably less than one-half that of 1872.

‘(4) The reduction of the cost of running trains, amounting to about one-fourth.

‘Under the influence of steady attention to train load we first largely reduced the mileage cost of carrying a passenger or a ton of goods. Then, having reduced our expenses, we were enabled to reduce our rates ; and then, by reducing our rates, we increased our traffic. We also saved in capital expenditure by reducing the quantity of rolling and locomotive stocks, and of station accommodation of all kinds, &c., &c., that was needed to meet the requirements of the traffic.

‘The very different conditions of the two countries do not admit of any useful comparison of the money receipts and charges between the East Indian and North-Eastern Railways. As to train

loads, however, it may be remarked that the passenger-train loads, though four times those of the North-Eastern, are less than on several other Indian lines. The cause lies in our rates, which are still too high. In goods, although we have nearly doubled our train loads since 1872, the goods and mineral train loads should be greater than they are, and I have no doubt that a judicious reduction of rates would lead to an increase in quantities carried that would be profitable. There are, however, difficulties in the way of making provision for any considerable increase to traffic, whether in passengers or goods, that render any immediate action in this direction impracticable.

‘If it be asked what have ton and passenger mileage returns to do with all this, the reply is, that with ton and passenger mile returns as well as passenger and goods train miles, you arrive at once at the average passenger and goods train loads, and these are a test of the healthy management of a line such as a healthy pulse is to the human being. Making, of course, due allowances for variation of circumstances, they are infallible. Low train loads, except under known or easily ascertainable circumstances, point, without doubt, to faulty management. If uncorrected, they will lead a line to destruction, for low train loads mean high train mileage. The working expenses of a railway are not necessarily

U

proportionate to the traffic carried, but to the effort made to carry the traffic—that is, mainly to the train mileage run ; and a needlessly high train mileage means capital and revenue wasted in every possible form, and, worse than this, it means rates and fares beyond the necessities of the cases, and consequent needless burdens on commerce. The public always pays ultimately for the blunders of railway management.

‘We who are connected with India are free, at any rate to a great extent, from this reproach, but this is due, in a degree which possibly will never be fully admitted, to our ton and passenger mileage returns, and the way they have been forced by the Administrations on the attention of the Executives of Indian Railways.’

CHAPTER XXVII

GROWTH IN THE LOADING OF FREIGHT TRAINS IN THE
UNITED STATES, INDIA, AND ENGLAND COMPARED

THE train load of the East Indian Railway has thus been increased from 113·75 tons in the first half of 1872 to 201·59 tons in the first half of 1901; and if Indian railways had realised the advantage of using the large American waggons, the growth in the train load would have been still more marked. The Americans have appreciated the economy of moving traffic in as few trains and as few waggons as the nature of the traffic will permit. The Indian railways have realised this to the extent of loading their trains more heavily, but they have not yet realised the full importance and value of large-capacity waggons, Indian engineers being still on the side of comparatively small four-wheeled waggons (*vide* chapter xiv., page 124). When the Indian railway companies realise the advantage of using waggons of greater capacity than 18 tons, they will doubtless fix higher standards of train and waggon loads to work up to, as the American lines have done in recent years. Roughly, the position is

that America, by the use of ton mileage, train load and car load statistics, has brought up its train and car loads to very high totals. India, by the use of these figures, has made an important addition to its train loads. And England, which does not compile ton mileage, passenger mileage, train load and car load figures, has made little or no improvement in the loading of its trains. To show the great growth in the train loads of the United States, the moderate growth in India, and the trifling improvement here, we set out below the actual average train loads of the Lake Shore and the East Indian, and the estimated train loads of the London and North-Western, in 1872, 1880, 1890, and in 1900 :—

Year	Actual		Estimated London and North-Western Railway
	Lake Shore Railroad	East Indian Railway	
	Tons	Tons	Tons
1872 . .	134	113·75 ¹	59·4
1880 . .	252	148	65·6
1890 . .	268	202	65·5
1900 . .	455	196	68·6

¹ June half, 1872. Other figures for complete years.

From the above contrast the reader will appreciate the reason for our having preferred American to Indian experience of the value of train load figures. Both teach the same unmistakable lesson.

INDEX

- AMALGAMATED Society of Railway Servants, influence of, 94
- Armytage, Sir George J., Bart. (Chairman of Lancashire and Yorkshire Railway), on adoption of heavy train loads, 100, 113; on make-up of trains on a tonnage basis equal to haulage capacity of engine, 274
- Aspinall, Mr. J. A. E. (General Manager of Lanes. and Yorks), in sympathy with improved methods of working, 276
- Atchison train load, the, 126, 127
- Automatic signalling, principle of the 'Hall' system, 239, 240
- BALFOUR, Right Hon. GERALD (President of Board of Trade), at meeting of Railway Benevolent Institution (May 1901), 57
- Baltimore, coal shipping facilities at, 224
- Bayley, Mr. C. W. (Traffic Manager of Lanes. and Yorks), his visit to United States to gather improvements, 276
- Belgium: competition with Great Britain, in iron and steel goods, 33, 132
- Blyth Docks (North-Eastern), 225
- Brake-power in India, 126, 127, 129
- British railways: traffic, receipts, and efficiency of L. & N.-W., 15 *et seq.*; compared with Pennsylvania Railroad in these respects, 38-50; Parliamentary restrictions on railways, 58, 83, 87, 88, 91, 92; Railway Stockholders' Association suggested, 80-82;—that idea amplified, 83-89;—still further developed, 90-96; heavy train loads advocated, 84; adoption by various lines of big mineral and merchandise trucks, 86; rehousing of the working classes and workmen's trains, 87, 88, 91, 92; reduced hours for railway servants, 88, 89; rating of railway companies, 94, 109; influence of Amalgamated Society of Railway Servants, 94; gloomy views of railway chairmen, 97; fall in price of coal and material, 98; adoption of American methods, 99; offer of Pennsylvania Railroad, 99; adoption of American system of train loading by Lancashire and Yorkshire Railway, 100; savings in train mileage of eighteen companies, 100-107; Mr. Green on the railway position, 108-112; causes of the fall in railway dividends, 109-112; tonnage basis and haulage capacity, 113; terminal accommodation for passenger traffic, 114; special difficulties facing railway development, 117; regulations for construction of traders' waggons, 118; inducements to

British Railways (*continued*):

traders to modify their appliances, 119; economy by use of 30-ton trucks, 120; Indian railway expert on heavy train loads and larger waggons, 124-127; possession of small trucks an obstacle to large train loads, 128; essentials to railway prosperity, 130; matters affecting railways—foreign competition in various branches of industry, 132, 133;—pig-iron production, 133, 134; consumption of cotton by spinners, 134, 135;—true causes of recent prosperity, 135; competition of electric traction, 138-141; influence of methods of operation of L. & N.-W., 142 *et seq.*; competition of water traffic, 145; larger cars and heavier loads the solution, 145; synopsis of L. & N.-W.'s traffics, earnings, expenditure, system, working, and projects, 145-168; of the Midland's, 169-189; of the Great Western's, 190-213; of the North-Eastern's, 214-265; of the Lancashire and Yorkshire's, 270-296; Sir Richard Strachey's Note on the Indian railways system, 298-306. See under L. & N.-W., Midland, Great Western, North-Eastern, Lancs. and Yorks

Buchanan Street Station, Glasgow, proposed improvement of, 115

Burt, Mr. Philip (General Traffic Manager of North-Eastern), 224, 230, 259

CALEDONIAN Railway: increase in size of mineral trucks 86; Sir

James Thompson's adoption of American methods, 114-118

Capital: London and North-Western, 164; Midland, 189; Great Western, 213; North-Eastern, 254; Lancashire and Yorkshire, 296

Carriage load explained, 69, 71;—New York Central, 76

Carriage mileage, 69, 71;—New York Central, 76

Carriages, number per train, 69, 72;—New York Central, 76

Castle Cary and Longport (G. W.), connection between, 192

Chesapeake and Ohio Railroad, average revenue load, 127

Chief Goods Manager's Department, N.-E., 260, 263-265

Chief Passenger Agent's Department, N.-E., 260, 262, 263

Coal and coke shipment by North-Eastern, docks and staiths served, 231. See under North-Eastern

Coal trade. See under various lines

Coal waggons, dimensions of standard size, 118

Coke waggons, dimensions of standard size, 118

Cotton manufacturing industry, the, 132; consumption by spinners, 134, 135, 271. See under Lancs. and Yorks

Crewe Junction (L. & N.-W.), improvements at, 165-167

DANVERS, Sir JULIAN (formerly Government Director of Indian Railways), his annual report, 301

Darlington Waggon Co., building hopped coal trucks, 232

Davies, Mr. E. L. (Chief Passenger Agent, N.-E.), 260

- District Goods Managers, N.-E., 260
 District Passenger Agents, N.-E., 260
 District Superintendents, N.-E., 259
 Dividends : London and North-Western, 164 ; Midland, 188 ; Great Western, 213 ; North-Eastern, 253 ; Lancashire and Yorkshire, 296
 Divisional Superintendents, N.-E., 259
 Docks and staiths served by North-Eastern, coal and coke shipment, 231. See North-Eastern
- EARNINGS : London and North-Western, 44, 48, 50, 55, 56, 163 ; freight, 148 ; passengers, 153, 154 ;—Pennsylvania, 44, 48, 50 ; eighteen English railways, 101, 102 ;—Midland, from freight, 173, 175 ; passengers, 179 ;—Great Western, freight, 195 ; passengers, 201 ;—North-Eastern, passengers, 241 ; freight, 243 ;—Lancashire and Yorkshire, freight, 278 ; passengers, 285
 East Indian Railway, 126 ; standard mineral train, 127 ; Sir R. Strachey on the bearing of accurate statistics of working on the economical management of railways, 298-308 ; adoption of ton and passenger mileage returns, 299, 300 ; weekly statements of working, 302 ; comparison of passenger and goods traffic for first half of 1872 with first half of 1901, 302, 303 ; main features of this comparison, 304 ; improvements suggested, 307, 308 ; actual average train load compared with Lake Shore, and estimated L. & N.-W., 308
- Edinburgh, electric railway proposed to Glasgow, 140
 Electric railways, Liverpool to Manchester, 140 ; proposed, from London to Brighton, 140 ; between Glasgow and Edinburgh, 140
 Electric tram-cars, competition of, with railways, 109, 138-141
 Ellison & Co. (Liverpool) on consumption of cotton by spinners 135
 Engine loads, 69, 71 ;—New York Central, freight, 75 ; passengers, 76
 Engine mileage, 69, 71 ;—New York Central, freight, 75 ; passengers, 76
 Euston Terminus (L. & N.-W.), improvements at, 167
 Expenses : London & North-Western, 44, 48, 50, 55, 56, 159-163 ; Pennsylvania, 44, 48, 50 ; Midland, 183-187 ; Great Western, 208-212 ; North-Eastern, 247-252 ; Lancashire and Yorkshire, 290-295
 Expenses per passenger per mile, 69 ; London and North-Western, 39, 40, 41, 55, 56 ; Pennsylvania, 39, 40, 41 ; East Indian, 303
 Expenses per ton per mile, 69 ; London and North-Western, 35, 36, 37, 55, 56 ; Pennsylvania, 35, 36, 37 ; East Indian, 303
- FARES, cheap, for the working classes, 88, 139
 Forsyth, Mr. James (Assistant Traffic Manager, N.-E.), 259
 France : woollen and worsted trade, 133 ; boot trade, 133
 Furness Railway : increase in size of mineral trucks, 86 ; goods train results, 101 ; passenger train results, 102 ; percentage

Furness Railway (*continued*) :

increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104, 105

GAINES, Mr. F. F. (Mechanical Engineer of Lehigh Valley Railway), results of his practical investigations into comparative cost of conveying large and small trucks, 120-123; tables on actual and virtual results, 121, 122

General Superintendent's Department, N.-E., 259, 261, 262

Germany: iron and steel goods competition with Great Britain, 33, 132; trade in chemicals, 133

Gibb, Mr. George S. (General Manager of North-Eastern), his compilation of figures of passenger mileage, ton mileage, and train loads, 214, 215; advocates increase of loads, 224; official figures supplied by him, 226, 229; compilation of train load figures in tons, 244; liberal expenditure policy during trade activity to counteract the period of depression, 253

Glasgow, Central Station, terminal accommodation for passenger traffic, 114; electric railway proposed to Edinburgh, 140

Grangemouth Harbour, new works at, 116

Great Central Railway, goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104; working with G. W. on new line from Neasden, 192; result of extension to London on other lines, 242

Great Eastern Railway: goods train

results, 100; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

Great Northern Railroad (U.S.), 73

Great Northern Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

Great Western Railway: goods train results (1900, 1901), 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains (1900, 1901), 103, 104; roadway and system, 190, 191; mineral and merchandise traffic (1900), 191; progressive policy, 192; extensions and improvements, 192; working with Great Central, 192; route shortening to Queenstown, 193; cut-offs and new connections, 193; outlay on lines in construction, 193; falling dividend, 194; earnings, mileage, receipts per mile of freight trains contrasted (1901, 1900, 1896), 194, 195; revenue from freight traffic (same years), 195; freight receipts, rates per ton per mile and ton mileage (1901), 196; freight train mileage compared with Midland and L. & N.-W., 196; average load, 196; tons, mileage and load, freight rate and earnings (1901), 197; average loads of merchandise and minerals and total of goods, 197; more powerful locomotives, 198; growth in passenger earnings, 198, 199; earnings and mileage of pas

- Great Western Railway (*continued*):
 senger trains contrasted with receipts (1900-1, 1899-1900, 1896), 199; policy of filling first and second class carriages, 200; season tickets, parcels, horses, &c., mails, 200, 201; receipts of passenger trains (1901, 1900, 1896), 201; charges per passenger per mile, 201; average rate for season tickets, 202; number of passengers, receipts, rate per passenger, and passenger mileage (1901), 202; season ticket receipts (1900), 203; average passenger train loads, 204; passenger train results, 205; increased density of traffic and increased train loads, 205; saving in train mileage, 206, 207; reduction in expenditure, 207, 211; expenditure on wages, material, coal, &c. (1900-1, 1899-1900, 1896), 208, 209; estimated increase in expenses on 1896 level, 210; saving when prices fall back to those of 1896, 210, 211; profits and dividends for 1901 contrasted with those of previous years, 212; dividends paid in each year from 1872, 213; amounts, prices and yields of stock, 213; average haul of freight, 218; estimated compared with actual loads of North-Eastern, 228; improved loading contrasted with North-Eastern, 242, 243; earnings per passenger train mile contrasted with North-Eastern (1901, 1896), 246; ditto earnings for freight train mile, 247
- Green, Mr. Richard, suggests a Railway Stockholders' Association, 80-82; on the railway position, 108-112
- 'HALL' Signal Company of New York, experimental installation of their system of automatic signalling on North-Eastern, 239, 240
- Harrison, Mr. F. (General Manager London and North-Western), his visit to the States, 214
- Haul, average lengths of, explained, 69, 72; increase of hauling capacity of engines and waggons urged, 112;—London and North-Western, passengers, 24, 41; freight, 28, 37;—Pennsylvania, freight, 37; passengers, 41;—New York Central, freight, 75; passengers, 76;—North-Eastern, freight, 220; passengers, 223;—Lancashire and Yorkshire, freight, 281
- Heaton Lodge and Wortley Railway, construction of, 167
- High Wycombe, Princes Risborough, Grendon Underwood, new branches from Neasden (G. W.), 192
- Hill, Mr. James J. (President of Great Northern, U. S.), his economical plan of heavy train loads, 73
- Hillingdon, Lord, at May 1901 meeting of Railway Benevolent Institution, 57
- Hope, Mr. George (Assistant Superintendent, N.-E.), 259
- Hoppered trucks for coal carriage (N.-E.), 232
- Houses for working classes, suburban, 139
- Hull and Barnsley Railway, goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

INDIAN railways: expert on heavy train loads and larger waggons, 124-127; reply to his statements, 127; train loads compared with those of America, 126; brake power, 127, 129; load smaller than American, 127; use of bogie waggons, 128; cotton manufacturing industry, 132, 135. See East Indian Railway

Industrial dwellings problem, the, 139

JAPAN: cotton manufacturing industry, 132

LABOURERS' dwellings, cost of reconstructing, 87, 91, 92, 139

Lake, Mr. E. (Assistant Goods Manager, N.-E.), 260

Lake Shore Railroad (U.S.), average revenue load, 127; actual average train load compared with estimated L. & N.-W., 308

Lancashire and Yorkshire Railway: increase in size of merchandise waggons, 86 note; adoption of American system of the grading of engines, 100; goods train results (1900, 1901), 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains (1900, 1901), 103, 104; goods trains made up to a tonnage basis equal to haulage capacity of engines, 113, 115, 274; extent of system, 270; prosperity influenced by activity of cotton, wool, coal and iron industries, 270, 271, 272; effect of reducing freight train mileage, 274; building 30-ton merchandise waggons, 275; di-

mensions of the new 'bogie' waggons, 276; Mr. Bayley's mission to the United States to report upon improvements, 276; tonnage of coal and coke, merchandise and minerals, 277; earnings, mileage, and receipts of freight trains (1900-1, 1899-1900, 1896), 278; contrast of receipts from merchandise, live stock, and minerals (1900-1, 1899-1900, 1896), 279; freight receipts rate per ton per mile, and ton mileage (1901), 280; average of haul compared with N.-E. and N.-W., 280; ton and train mileage, load, tonnage, haul earnings, &c. (1901), of freight trains, 281; average loads, 281; loads compared with those of other companies (1901), 282; receipts per train freight mile in same comparison, 282; earnings, mileage, and receipts of passenger trains (1900-1, 1899-1900, 1896), 284; growth in receipts from ditto, with decline in first class (same year), 285; number of passengers, receipts, rate per passenger and passenger mileage (1901), 285; season ticket receipts (1900), 286; average passenger train loads, 286; passengers carried one mile (1901, 1896), 288; passenger train results, 288; expenditure on wages, material, coal, &c. (1900-1, 1899-1900, 1896), 290; ditto, if at 1896 prices (1901, 1896), 291; saving when prices fall to 1896 level, 292; growth of earnings contrasted with that of other companies, 293, 294; gross earnings (1900-1 and 1896), 294; earnings, profits, and dividends (1900-1, 1899-1900, 1896), 295; dividends dis-

Lancashire and Yorkshire Railway
(continued):

tributed since 1872, 296; amounts,
prices, and yields of securities, 296

Lehigh Valley Railway (U.S), Mr.
Gaines's investigations, 120

London and Brighton Railway,
goods train results, 101;
passenger ditto, 102; percentage
increases in goods and passenger
train earnings, 103, 104

London and North-Western Rail-
way: considered as premier line in
traffic receipts and efficiency, 15;
passenger mileage and passenger
train load, 17; number of pas-
sengers (1st, 2nd, 3rd, season,
1880, 1890, 1900), 17; total
number of passengers (ordinary,
season, same years), 18; receipts
from passengers (1st, 2nd, 3rd,
season, same years), 18; average
rate per passenger per mile (ditto),
19; number of passengers carried
one mile (ditto), 20; passenger
train mileage (ditto), 21; number
of passengers carried per train
mile (all classes and season, same
years), 22; passenger train results
(same years), 24; ton mileage and
freight train load, 25; revenue
from goods traffic (1880, 1890,
1900), 25; rates per ton per mile
(same years), 26; ton-miles (same
years), 26; comparison tonnage,
mileage, and train loads (same
years), 27; goods train results
(same years), 28; train loads
and expenses per ton per mile
contrasted with those of the
Pennsylvania Railroad, 35; earn-
ings and expenses per ton per
mile (1900, 1880), 36; cost of
moving a ton one mile con-
trasted with Pennsylvania, 36;

freight results contrasted with
same company, 37; expenses per
passenger per mile contrasted
with Pennsylvania's, 39; earnings
and expenses per passenger per
mile (1900, 1880), 40; cost per
passenger per mile (1900, 1880),
40; passenger results per mile
contrasted with Pennsylvania's,
41; comparison of earnings and
expenses with same, 44; ratio
of expenses to receipts contrasted
with same, 44; comparison with
Pennsylvania on similar average
rates per ton, and passenger per
mile, and length of haul, 48;
comparison of ratios of expenses
to gross earnings with same
company, on basis of similar rates
and lengths of haul, 49; expenses,
net earnings and profits, if worked
as economically as Pennsylvania,
50; gross earnings, expenses,
and net earnings for 1880, 55;
for 1900, 56; its Bill thrown out
on the question of rehousing, 92;
goods train results, 101; pas-
senger ditto, 102; percentage
increases or decreases in earnings
in mileage and receipts per mile of
goods and passenger trains (1900,
1901), 103, 104; influence of its
methods of operation on other
lines, 142, 143; punctuality and
quick delivery, 143, 144; larger
cars and heavier loads advocated,
145; expectation of saving in
train mileage, 146, 147; mineral
and merchandise tonnage, 147;
revenue from freight traffic in
past five years, 148; earnings,
mileage, and receipts of freight
trains, 149; freight rate per ton
per mile, 150; ton mileage, 150;
improvement in engines, 151;

L. & N.-W. Ry. (*continued*):

increase in train load and reduction in goods train mileage, 151, 152; increase of passenger trains and mileage, 152; earnings and mileage of passenger trains and receipts per passenger train mile contrasted (1900-1, 1899-1900, 1896), 153; receipts of passenger trains from all sources, 154; passenger mileage (June 1901), 155; season ticket receipts (1900), 155; average passenger train loads, 156; passenger train results, 157; existing and possible train loads, 158; expenditure on wages, material, coal, &c, (1900-1, 1899-1900, 1896), 159; results which might have been secured in 1901 had prices of material and coal been as in 1896, 160; reduction in expenses when prices of coal and material fall back to 1896 level, 161; earnings, charges, profits, and dividends for 1900 and 1901 and for 1896, 163; dividends paid for each calendar year (1873-1901), 164; amount of and prices for company's securities and yields afforded, 164; improvements made at Crewe, 165-167; and at Euston and Willesden, 167; line construction and widening, 167, 168; earnings and expenses contrasted with those of the Midland, 184; freight train mileage and average load compared with Great Western, 196; average rate for season tickets, 202; Mr. Harrison's investigation of passenger mileage, ton mileage, and train loads in United States, 214; average haul of freight, 218; estimated compared with actual

loads of North-Eastern, 228; earnings per passenger train mile contrasted with North-Eastern, 246; ditto earnings per freight train mile, 247; estimated train loads compared with actual of Lake Shore and East Indian, 308
 London and South-Western Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104
 London and Tilbury Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

MATHIESON, Mr. JOHN (General Manager of the Midland Railway), 171

Metropolitan District Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings, in mileage and in receipts per mile of goods and passenger trains, 103, 104; under electrical traction, 238

Metropolitan Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings, in mileage and receipts per mile of goods and passenger trains, 103, 104; electrical traction, 138

Midland Railway: its train-racing to Scotland denounced, 81, misguided bid for Scotch traffic, 91; goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings, in mileage and receipts per

Midland Railway (*continued*):

mile of goods and passenger trains (1900, 1901), 103, 104; its system and operations, 169; adherence to first and third class only, 169; coal tonnage, 170-172; larger trucks for mineral traffic, 170; appointment of Mr. J. Mathieson as general manager, 171; tonnage, 172; freight traffic in 1900, 172; revenue from freight traffic in past five years, 173; prospective contraction in coal traffic, 174; earnings, mileage, and receipts of freight trains contrasted (1900-1, 1899-1900, 1896), 174; freight receipts, rates per ton per mile, and ton mileage, 175; ton and train mileage, average rate, earnings, 176; effect of increasing train loads, 177; average loads of merchandise and minerals and total average loads of freight, 177; passenger traffic, 178; earnings, mileage, and receipts per train mile of passenger trains contrasted (1900-1, 1899-1900, 1896), 178; receipts of passenger trains in the three years, 179; passengers, receipts, rate per passenger and passenger mileage, 180; season-ticket receipts (1900), 180; average passenger train loads, 181; passenger train results, 181; effect of increasing passenger train load, 181; existing and possible train loads, 182; expenditure on wages, material, coal, &c., contrasted (1900-1, 1899-1900, 1896), 183; growth in expenses contrasted with those of L. & N.-W., 184; estimated expenditure for last financial year based on 1896 prices and increase in gross

earnings, 185; approximate saving with prices at 1896 level, 186; effect on profits of past year's expenditure in contrast with previous year and 1896, 187; dividends paid since 1872, 188; amounts, prices, and yields of stocks, 189; average train load compared with the Great Western, 196; average rates per passenger per mile for season tickets, 202; average haul of freight, 218; estimated train load compared with actual loads of North-Eastern, 228; earnings per passenger train mile contrasted with North-Eastern, 246; ditto earnings per freight train mile, 247

Mono-electric line from Liverpool to Manchester, 140

NEASDEN to High Wycombe (G. W.), 192

New York Central: statistics of freights and mileage, 74; working results, 75; contrast of passenger trains and carriage results, 76; expenses for transportation, 77; savings effected, 78

New York Railroad Club, 120

Newell, Mr. T. M. (Dock Engineer of North-Eastern), 224

Norfolk and Western (U.S.), average revenue load, 127

North-Eastern Railway: increase in size of their mineral waggons, 86 note; goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains (1900, 1901), 103, 104; coal tonnage, 170; official figures of passenger mileage, ton mileage; and train loads, 214,

North-Eastern Railway (*continued*):

215; adoption of the ton mile and the passenger mile in place of train mile, 215; freight receipts and rates per ton mile (1900), 216; average loads of merchandise, mineral, and total freight trains (1900), 217; average haul of freight (1900), 218 219; charge of coal for shipment, 219; freight traffic results (1900), 220; passengers, receipts, rates, and passenger miles (1900), 221, 222; passengers per train and average distance hauled (1900), 222; passenger traffic results (1900), 223; the new methods of working, 223; Mr. Gibb's view on increase of loads, 224; visit of officials to United States, 224; increased size of trucks and more powerful engines, 225; increase in train load, 226; official figures supplied by Mr. Gibb, 226, 227; average rates and train loads compared with those of L. & N.-W., Midland, and Great Western, 226-228; its actual merchandise and mineral train loads compared with estimated loads of these companies, 228; hauling capacity of most powerful mineral engines, 229; facilities for introduction of large waggons to system, 230; coal and coke conveyed for shipment during 1900, 231; particulars of hopped trucks for coal carriage building, 232; weight and length of a train of twenty 32-ton trucks compared with train of sixty-four 10-ton trucks, 233; total tonnage of goods and minerals carried in 1900, 233;

constituents of mineral traffic, 234; excellence of the management, 235, 236; maintenance of permanent way and rolling stock paid for out of revenue, 236; depreciation provided for, 237; docks, 237; sliding scale for regulating carriage rates for iron-making materials, 237, 238; experimental installation of the 'Hall' Signal Company's automatic signalling, 239, 240; great expansion in earnings, 240; receipts of passenger trains (1900-1, 1899-1900, 1896), 241; earnings and mileage contrasted with receipts of passenger trains (past two years and 1896), 242; improved loading contrasted with G.W., N.-W., and Midland, 242; revenue from freight traffic contrasted (1901, 1900, 1896), 243; economies in goods traffic, 243, 244; Mr. Gibb's method of compiling train-load figures in tons, 244; earnings, mileage, and receipts of freight trains contrasted (1901, 1900, 1896), 245; earnings of freight trains contrasted (1900, 1896), 246; earnings per passenger train mile (1901, 1896) contrasted with L. & N.-W., Midland, and G. W., 246; earnings per freight train mile contrasted with same companies', 247; increase in gross earnings and in wages, 247; coal contracts, 247, 248, 251; expenditure on wages, material, coal, &c. (1900-1, 1899-1900, 1896), 248; contrast of expenses at 1896 prices with actual expenditure, 249, 250; minimum reduction in expenditure from decline in prices to 1896 level, 250, 251; net in-

North-Eastern Railway (*continued*):

come (1901), 251; earnings, charges, profits and dividends (1900-1, 1899-1900, 1896), 252; contrast of yearly dividends from 1872, 253; amounts and prices of stocks and yields afforded, 254; important reorganisation of traffic department, 255, 256; details of reorganisation, 257-259; list of traffic officers, 259, 260; new departmental regulations: General Superintendent's, 261, 262; Chief Passenger Agent's, 262, 263; Chief Goods Manager's, 263-265; Sir R. Strachey's Note, 298

North London Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

North Staffordshire Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104; Mr. Philipps on the value of ton mileage, 266-268; merchandise and mineral traffic, 269

Number of passenger coaches per train, explained, 72

Number of waggons per train, explained, 72

PAGET, Sir ERNEST, his statement at half-yearly meeting of the Midland, 171

Passenger mileage, term explained, 68, 71; of London and North-Western, 20, 24, 41, 55, 56, 155;

Pennsylvania RR., 41; New York Central RR., 76; Midland, 180; Great Western, 202; North-Eastern, 222; Lancashire and Yorkshire, 285

Passengers, number, 69; of London and North-Western, 17, 18, 24, 41, 155; Pennsylvania, 41; New York Central, 76; Midland, 180; Great Western, 202; North-Eastern, 222; Lancashire and Yorkshire, 285

Pennsylvania Railroad train loads and expenses per ton per mile contrasted with those of L. & N.-W., 35; earnings and expenses per ton per mile (1900, 1880), 36; cost of moving a ton one mile contrasted with that of L. & N.-W., 36; freight results contrasted with same company, 37; earnings and expenses per passenger per mile, 39; cost per passenger per mile contrasted with that of L. & N.-W., 40; passenger results contrasted with those of the same company, 41; economy of passenger train mileage, 42; comparison of earnings and expenses with those of L. & N.-W., 44; ratio of expenses to receipts of ditto, 44; comparison of earnings and expenses with L. & N.-W. on similar average rates per ton, passenger per mile and length of haul, 48; comparison with same railroad of ratios of expenses to gross earnings on similar rates and lengths of haul, 49; willingness to place ton-mileage sheets at disposal of British railways, 99; average revenue load, 197

Phillipps, Mr. W. D. (Manager of North Staffordshire Railway), on the value of ton mileage, 266-268; a reply to his letter, 268, 269

Pig-iron production, British, compared with that of other countries, 134

Princes Risborough to Grendon Underwood (G. W.), 192

QUEENSTOWN: G. W.'s shorter route to, 193

RAILWAY Benevolent Institution (May 1901 meeting), 57

Railway servants, reduction of hours of labour of, 88, 89

Railway Stockholders' Association, suggested by Mr. Green, 80-82; approval and amplification of suggestion, 83-89; Mr. Touch on same, 90-96

Rate, average, per ton per mile, explained, 69, 72; of London and North-Western, 26, 28, 30, 36, 37, 55, 56, 150; Pennsylvania RR., 30, 36, 37; New York Central RR., 75; Midland, 175; Great Western, 196; North-Eastern, 216; Lancashire and Yorkshire, 280; East Indian, 303

Receipts, average, per passenger per mile, explained, 69, 72; of London and North-Western, 19, 24, 39, 40, 41, 55, 56, 155, 157; Pennsylvania, 39, 41; New York Central, 76; Midland, 180; Great Western, 202; North-Eastern, 222; Lancashire and Yorkshire, 285; East Indian, 303

Receipts, average, per train mile,

goods and passengers, 69; of London and North-Western, passengers, 24, 41, 154; freight, 28, 37, 149; — Pennsylvania, freight, 37, 41; — New York Central, freight, 75; passengers, 76; — Midland, freight, 174; passengers, 178; — Great Western, freight, 195; passengers, 199; — North-Eastern, freight, 220; passengers, 223; merchandise, 246; minerals, 246; — Lancashire and Yorkshire, freight, 278; passengers, 285; — East Indian, passengers, 303; freight, 303

Rehousing the working classes, on disturbance, 88, 91, 92

Rendel, Sir Alexander (Consulting Engineer of East Indian Railway), 298; his aid in promoting adoption of ton and passenger mileage returns, 300, 301

Robinson, Mr. W. (Chief Goods Manager, N.-E.), 260

SCOTLAND: suicidal train-racing to, 81, 85; improvements for passenger traffic at Glasgow, 114; adoption of latest methods by Caledonian, 114-118

Signalling, automatic, principle of the 'Hall' system, 239, 240

Smith and Forrest *v.* L. & N.-W. and others, case cited, 53

South African war, its effect on trade, 131

South-Eastern and Chatham Railway: goods train results, 101; passenger ditto, 102; percentage increases or decreases in earnings in mileage and per mile of goods and passenger trains, 103, 104

- Stalbridge, Lord (Chairman of L. & N.-W.), on comparisons of his company with American lines, 57-59, 60, 62; a reply to his statements, 60-67; on quick delivery, 144
- Steamship traffic, competition of, with railways, 145
- Strachey, Lieut.-Gen. Sir Richard (Chairman of East Indian Railway), his note on the bearing of accurate statistics of working on the economical management of railways, 298-308
- TECHNICAL railway terms explained, 70-72
- Terms, technical railway, explained, 70-72
- Thompson, Sir James (Chairman of the Caledonian), his adoption of American methods, 114-118, 121
- Ton mileage, term explained, 68, 70; of London and North-Western, 26, 27, 37, 55, 56, 150; Pennsylvania RR., 37; New York Central RR., 75; Midland, 175; Great Western, 196; North-Eastern, 216; Lancashire and Yorkshire, 280
- Tonnage, 69; of London and North-Western, 27, 37, 147; Pennsylvania RR., 37; New York Central RR., 75; Midland, 172; Great Western, 191; North-Eastern, 218; Lancashire and Yorkshire, 277
- Touch, Mr., on a suggested Railway Shareholders' Association, 90-96
- Traders' waggons: regulations for construction of, 118; new specifications, 147. See under various lines
- Traffic: cost of moving, in England and America compared, 32 *et seq.*; allocation of expenditure between freight and passenger, 53 *et seq.* See under various lines
- Train load, term explained, 69, 71; of London and North-Western, passengers, 22, 24, 156, 158; freight, 27, 37, 150, 158; merchandise, 152; minerals, 152;—Pennsylvania RR., freight, 37; passengers, 41;—New York Central RR., freight, 75; passengers, 76;—Midland, freight, 176; merchandise, 177; minerals, 177;—Great Western, passengers, 181; freight, 197; merchandise, 197; minerals, 197;—North-Eastern, passengers, 204; merchandise, 217; minerals, 217; freight, 217;—Lancashire and Yorkshire, merchandise, 281; minerals, 281; freight, 281; experimental, with waggons of various capacities, 122;—East Indian, passengers, 303; goods, 303;—London and North-Western, Lake Shore and East Indian compared, 308
- Train mileage, 69, 71; of eighteen railways, 101, 102;—London and North-Western, passengers, 21, 24; freight, 27, 37, 149, 150;—Pennsylvania RR., freight, 37; passengers, 41;—New York Central RR., freight, 75; passengers, 76;—Midland, freight, 174; passengers, 178;—Great Western, freight, 195; passengers, 199;—North-Eastern, freight, 217; passengers, 222;—Lancashire and Yorkshire, freight, 278; passengers, 288
- Tram-cars, competition of, with railways, 110

Trent Valley line (L. & N.-W.),
widening of, between Stafford and
Nuneaton, 167

Tyne Docks (North-Eastern), 225

UNITED STATES: competition between
railroads, 12; effects of
railroad amalgamation, 13; comparison
between Pennsylvania Railroad and
London and North-Western, 15-56;
competition with Great Britain in iron
and steel manufactures, 33; the
Great Northern of America, 78;
New York Central, 74-78; Sir
James Thompson's adoption of what
are called American methods, 114-118,
121; Mr. Gaines's investigations into
the economy of hauling short trains of
large cars, 120-123; train loads compared
with those in India, 126; four-wheel
discarded for bogie eight-wheel cars,
128; development of cotton manufacturing
industry, 132, 135; tinplate trade,
132; boot trade, 133; chemicals,
133; visit of North-Eastern

officials, 224; 'Hall' Signal Co.'s
automatic signalling, 239, 240;
supplying China with cotton goods,
272; Mr. Bayley's visit, 276;
waggons and trucks, increased size
advocated, 85, 115-118. See under
various lines

WAGGON loads, explained, 69, 71;

New York Central, 75

Waggon mileage, explained, 69, 71;

New York Central, 75

Waggons, number per train, 69, 72;

New York Central, 75

Water traffic, competition of, with
railway, 145

Watson, Mr. H. A. (General Superintendent,
N.-E.), 259

Willesden Junction (L. & N.-W.).
improvements at, 167

Wootton Bassett and Patchway
cut-off on the G. W., 192, 193

Workmen's dwellings, 87, 88, 91,
92, 139; fares, 88, 139

Worsdell, Mr. W. (Locomotive
Superintendent of the North-Eastern),
224; his class T engine, 229, 230



PRINTED BY

SPOTTISWOODE AND CO. LTD., NEW-STREET SQUARE
LONDON

THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW

MAY 8 1915

30m-1,'15

Paid,

192482

HE3016

P2

